# TOTAL DOSE RADIATION TEST REPORT

**Part Type : BA20**

**Package : TO-03**

**Description : Transistors - High power NPN**

**Manufacturer : STMicroelectronics**

**Date Code: NA**

**Top-Rel Purchase Order N° 5503571 dated 03/26/2010**

**Top-Rel Technical Responsible: Alessandro Cavagnoli**

| | | | | |
|---|---|---|---|---|
| **Hirex reference :** | HRX/TID/0772 | Issue : 01 | Date : | March 31st, 2010 |
| **Written by :** | C. BOUDOT | Technician | | |
| **Verified by :** | O.PERROTIN | Study Manager | | |
| **Authorized by:** | J.F. PASCAL | Technical Manager | | |

## CHANGE RECORD

| ISSUE | DATE | PAGE | DESCRIPTION OF CHANGES |
|---|---|---|---|
| 01 | March 31st, 2010 | All | Original Issue |

# TOTAL DOSE RADIATION TEST REPORT
# on BA20
# STMicroelectronics
# Transistors - High power NPN

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# 1 Introduction

A total dose radiation verification test of the STMicroelectronics BA20, Transistors - High power NPN has been performed with an accumulated dose of about 109 Krad(Si) at a dose rate of 275 rad(Si)/hour, in response to Top-Rel purchase order reference 5503571.

The purpose of this test was to evaluate total dose withstanding of this component, to investigate its suitability for being used in space applications. This test was conducted on samples provided by Top-Rel. Test has been performed in accordance with Hirex Engineering proposal reference HRX/PRO/2906 Issue 01 dated 09/12/2009.

A complete set of electrical measurements together with graphical representation of measured parameters with respect to total dose received, are provided for all samples.

# 2 Applicable and Reference Documents

## 2.1 Applicable Documents

- Hirex Engineering proposal: HRX/PRO/2906 Issue 01 dated 09/12/2009
- Top-Rel specification: TPR/PL/STM/1153 issue 01 dated 12/17/2009.

## 2.2 Reference Documents

- Manufacturer Datasheet

# 3 Test Samples

7 samples of the BA20 device were tested (6 ON + 1 control sample).

Samples were allocated into the bias conditions during exposures and annealing as provided in the following table.

| Serial Number | Allocation |
|---|---|
| 1 | Control |
| 2 | Biased ON |
| 3 | Biased ON |
| 4 | Biased ON |
| 5 | Biased ON |
| 6 | Biased ON |
| 7 | Biased ON |

Identification of the BA20 is given below:

**Part Number:** BA20

**Top Marking:** manuscript BA20 serial

**Diffusion Lot:**

**Date Code:** NA

# 4 Experimental Conditions

## 4.1 Radiation Source Dose Rate and Annealing

The dose exposures were performed at ENEA in the Calliope plant located at the CASACCIA research centre in ROME (Italy).
The $\gamma$ irradiation plant is a pool-type irradiation facility equipped with a $^{60}$Co gamma source in a large shielded panoramic room. The storage water pool, that houses the source, has dimensions of 2x4.4x8 $m^3$.
The emitted radiation has two photons of 1.173 and 1.332 MeV working in coincidence with a mean photon's energy of 1.25 MeV.
It is possible to vary the dose rate by simply adjusting the distance of devices under test to the source in a range of a few rad/H up to 2 Mrad/H.
The main Calliope features are reported in the table and Figure 1 below.

| | |
|---|---|
| Source: | $^{60}$Co |
| Geometry: | Cylindrical rack with radioisotope pencils placed on two levels of external rack surface |
| Emitted radiation: | 2 $\gamma$ photons emitted in coincidence |
| Photons Energy: | 1.173 and 1.332 MeV (average 1.25 MeV) |
| Max licensed activity: | $3.7x10^{15}$ Bq (100 kCi) |
| Dose rate range: | Few rad/h up to 2 Mrad/h |

**Table 1 : Calliope main features**

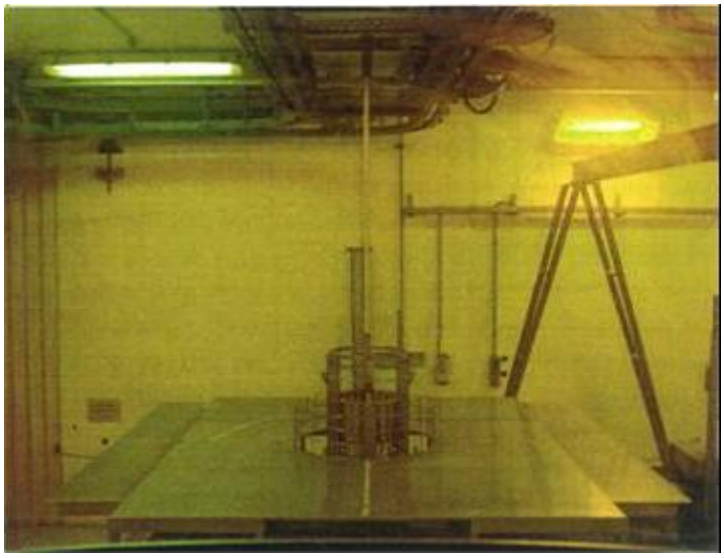


**Figure 1 : View of the $^{60}$Co $\gamma$ source through the yellow lead window of the control room**

The irradiation conditions used for this test are provided in the following table:

| Irradiation Steps | Dose rate | Annealing steps | Temperature |
|---|---|---|---|
| krads | krads/h | Hours | °C |
| 0 | | | |
| 26.3 | 0.275 | | Room |
| 52.2 | 0.275 | | Room |
| 78.1 | 0.275 | | Room |
| 108.6 | 0.275 | | Room |
| | | 24 | Room |
| | | 168 | 100 |

## 4.2 Bias during Dose Exposures and Measurements conditions

### 4.2.1 Bias conditions

During exposures test board allowed to bias 6 samples in accordance with the electrical circuit provided in Figure 1.
During annealing steps the same stress conditions were applied at room and 100°C temperatures.

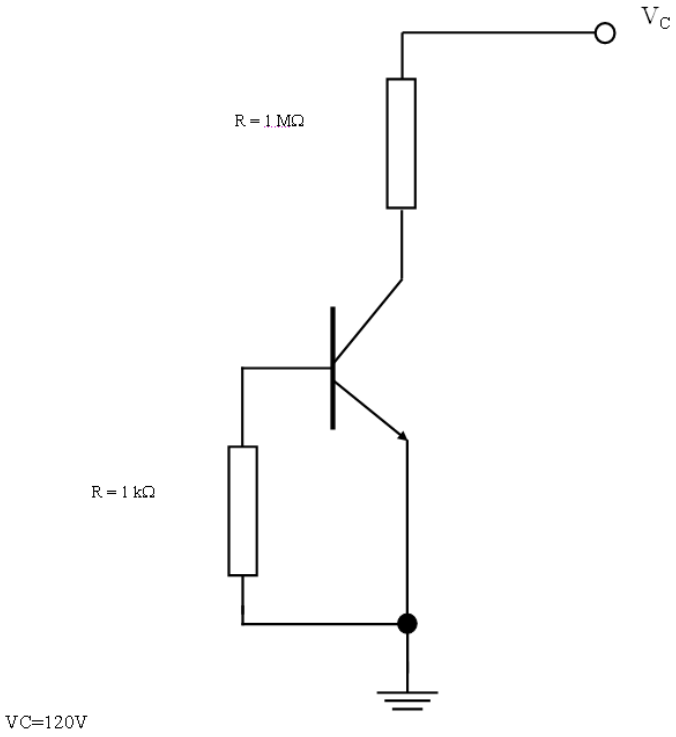



**Figure 2 : Bias Conditions during Irradiation Exposures and Annealing**

4.2.2 Electrical Measurements

Electrical parameters test program principle for BA20 is provided in Figure 2.

One HP4142 DC tester and a TEK371A curve tracer were used to perform required measurements.

A dedicated test fixture was designed to ensure proper measurement conditions. In addition a faraday cage was used to ensure optimum conditions for low level measurements.

Test results were automatically loaded in an Excel worksheet and compared in real time to specification limits. This allowed for real time data analysis in particular when failures were recorded.

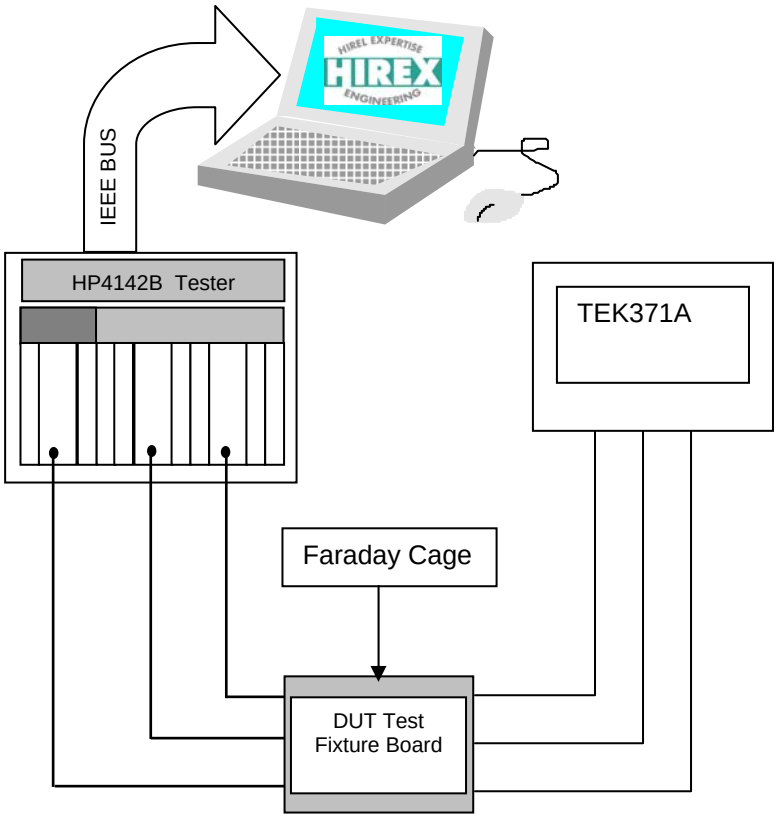



**Figure 3 : BA20 test program principle**

Electrical parameters test conditions and limits used for performing this test are given in the following table.

| PARAMETERS | SYMBOLS | TEST CONDITIONS | MIN | MAX | UNITS |
|---|---|---|---|---|---|
| Collector emitter voltage base open | Vceo | Ic = 200mA | 120 | - | V |
| Collector emitter cut off current | Iceo | Vcb = 80V | - | 10.0E-03 | A |
| Emitter base cut off current | Iebo | Veb = 7V | - | 10.0E-03 | A |
| Forward current transfer ratio 1 | hfe1 | Vce = 2V<br>Ic = 100µA | 1 | - | - |
| Forward current transfer ratio 2 | hfe2 | Vce = 2V<br>Ic = 1mA | 10 | - | - |
| Forward current transfer ratio 3 | hfe3 | Vce = 2V<br>Ic = 10mA | 10 | - | - |
| Forward current transfer ratio 4 | hfe4 | Vce = 2V<br>Ic = 100mA | 10 | - | - |
| Forward current transfer ratio 5 | hfe5 | Vce = 2V<br>Ic = 500mA | 10 | - | - |
| Forward current transfer ratio 6 | hfe6 | Vce = 2V<br>Ic = 1A | 10 | - | - |
| Forward current transfer ratio 7 | hfe7 | Vce = 2V<br>Ic = 2A | 10 | - | - |
| Forward current transfer ratio 8 | hfe8 | Vce = 2V<br>Ic = 4A | 10 | - | - |
| Forward current transfer ratio 9 | hfe9 | Vce = 2V<br>Ic = 6A | 10 | - | - |
| Forward current transfer ratio 9 | hfe10 | Vce = 2V<br>Ic = 8A | 1 | - | - |
| Forward current transfer ratio 9 | hfe11 | Vce = 2V<br>Ic = 10A | 1 | - | - |
| Forward current transfer ratio 9 | hfe12 | Vce = 2V<br>Ic = 15A | 20 | 100 | - |
| Forward current transfer ratio 9 | hfe13 | Vce = 2V<br>Ic = 20A | 20 | - | - |
| Collector emitter saturation voltage | Vce(sat)1 | Ic = 1A<br>Ib = 100mA | - | 1.5 | V |
| Collector emitter saturation voltage | Vce(sat)2 | Ic = 2A<br>Ib = 200mA | - | 1.5 | V |
| Collector emitter saturation voltage | Vce(sat)3 | Ic = 15A<br>Ib = 1.2A | - | 0.75 | V |
| Base emitter saturation voltage | Vbe(sat)1 | Ic = 1A<br>Ib = 100mA | - | 1.5 | V |
| Base emitter saturation voltage | Vbe(sat)2 | Ic = 2A<br>Ib = 200mA | - | 1.5 | V |
| Base emitter saturation voltage | Vbe(sat)3 | Ic = 15A<br>Ib = 1.2A | - | 1.5 | V |
| Base emitter voltage | Vbe1 | Ic = 100µA<br>Vce = 2V | - | 1.5 | V |
| Base emitter voltage | Vbe2 | Ic = 1mA<br>Vce = 2V | - | 1.5 | V |
| Base emitter voltage | Vbe3 | Ic = 10mA<br>Vce = 2V | - | 1.5 | V |
| Base emitter voltage | Vbe4 | Ic = 100mA<br>Vce = 2V | - | 1.5 | V |
| Base emitter voltage | Vbe5 | Ic = 500mA<br>Vce = 2V | - | 1.5 | V |
| Base emitter voltage | Vbe6 | Ic = 1A<br>Vce = 2V | - | 1.5 | V |

| PARAMETERS | SYMBOLS | TEST CONDITIONS | MIN | MAX | UNITS |
|---|---|---|---|---|---|
| Base emitter voltage | Vbe7 | Ic = 2A<br>Vce = 2V | - | 1.5 | V |
| Base emitter voltage | Vbe8 | Ic = 4A<br>Vce = 2V | - | 1.5 | V |
| Base emitter voltage | Vbe9 | Ic = 6A<br>Vce = 2V | - | 1.5 | V |
| Base emitter voltage | Vbe10 | Ic = 8A<br>Vce = 2V | - | 1.5 | V |
| Base emitter voltage | Vbe11 | Ic = 15A<br>Vce = 2V | - | 1.6 | V |

**Table 2 : Measured electrical parameters**

# 5 Conclusion

A Total Ionizing Dose verification test was carried out by Hirex Engineering under Top-Rel contract on the STMicroelectronics BA20 Transistors - High power NPN in TO-03 package.
6 samples plus one control sample were used during testing. They were exposed to radiation using a dose rate of 275 rad(Si)/hour at room temperature.

All parameters remained within specification limits all along testing.

# 6 Test Results

Test results including tables and graphics are provided in this section for each measured parameter.

Failed values with respect to specified limits are highlighted in bold red font in the tables.

Post irradiation values are calculated using 3σ approach.

- For positive variation $(X)_{LOT+} = \text{mean}(X) + 3 \times \sigma(X)$
- For negative variation $(X)_{LOT-} = \text{mean}(X) - 3 \times \sigma(X)$
- $(X)_{LOT\ WORST\ CASE} = Worstcase((X)_{LOT+}, (X)_{LOT-})$

Post irradiation parameters drifts (noted $\Delta X$) are defined as follows:

$$\Delta X = X_{post\ rad} - X_{initial}$$

Where $X_{post\ rad}$ stands for the value of X after irradiation (at 50krads (Si), 70krads (Si) or 100krads (Si)) and $X_{initial}$ stands for the pre-irradiation value of X.

Post irradiation drift values are calculated using 3σ approach.

- For positive variation $\Delta(X)_{LOT+} = \text{mean}(\Delta X) + 3 \times \sigma(\Delta X)$
- For negative variation $\Delta(X)_{LOT-} = \text{mean}(\Delta X) - 3 \times \sigma(\Delta X)$
- $\Delta(X)_{LOT\ WORST\ CASE} = Worstcase(\Delta(X)_{LOT+}, \Delta(X)_{LOT-})$

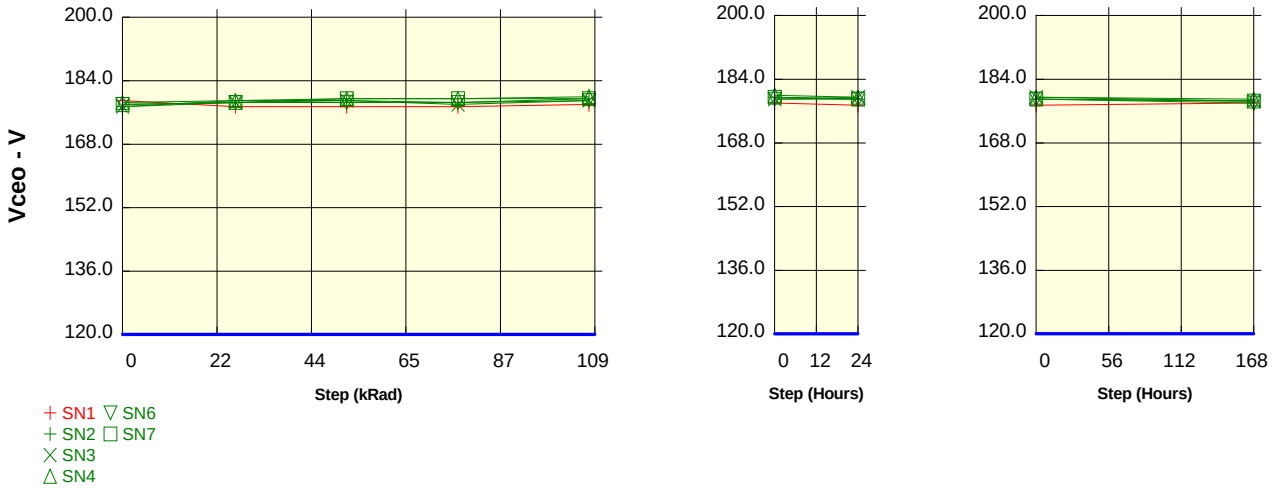
For bipolar transistors, drifts on forward current transfer ratio are calculated as follows:

$$\Delta\left(\frac{1}{h_{FE}}\right)_{LOT} = \text{mean}\left(\Delta\frac{1}{h_{FE}}\right) + 3 \times \sigma\left(\Delta\frac{1}{h_{FE}}\right)$$

$$[h_{FE}]_{POST\ RAD} = \frac{1}{\Delta\left(\frac{1}{h_{FE}}\right)_{LOT} + \frac{1}{h_{FE(min)}}}$$

Where σ stands for standard deviation and $h_{FE(min)}$ stands for the pre-irradiation spec minimum $h_{FE}$ limit available in table 2.

**Test conditions : TID**
**Parameter : Collector to Emitter Voltage Base Open : Vceo**
**Ic = 200mA**
Unit : V
Spec Limit Min : 120.0
Spec limits are represented in bold lines on the graphic.



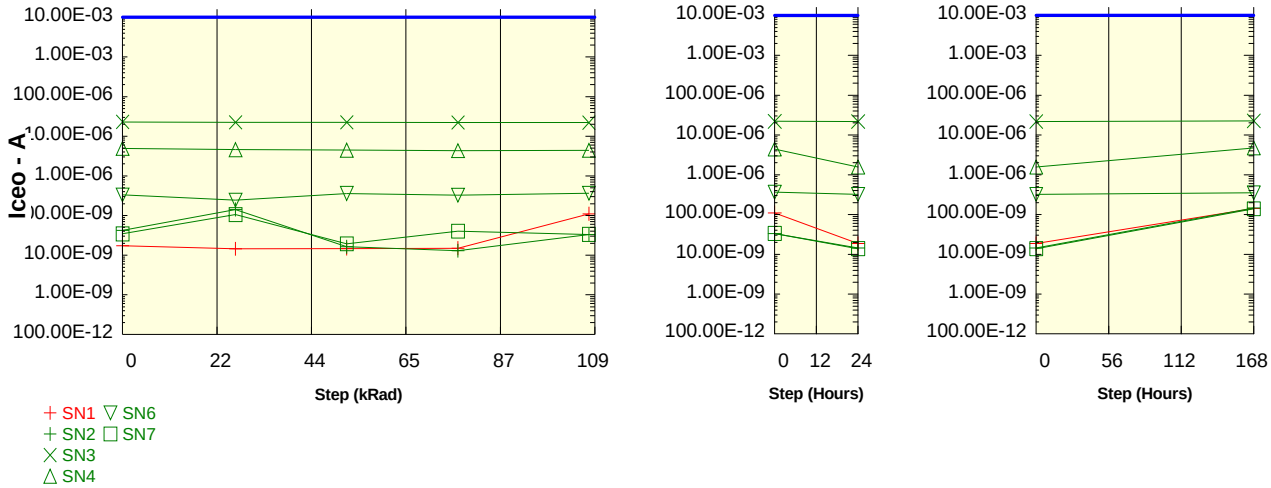

**Measurements**

| Vceo | 0 kRad | 26.3 kRad | 52.2 kRad | 78.1 kRad | 108.6 kRad | 24 Hours | 168 Hours |
|---|---|---|---|---|---|---|---|
| SN1_REF | 179.0 | 177.5 | 177.5 | 177.5 | 178.0 | 177.5 | 178.0 |
| On samples | | | | | | | |
| SN2 | 177.5 | 179.0 | 179.0 | 178.5 | 179.5 | 179.0 | 178.5 |
| SN3 | 177.5 | 178.5 | 179.0 | 178.0 | 179.0 | 179.5 | 178.5 |
| SN4 | 178.5 | 179.0 | 179.5 | 179.5 | 180.0 | 179.5 | 179.0 |
| SN6 | 178.0 | 178.5 | 178.5 | 178.5 | 179.0 | 179.0 | 178.0 |
| SN7 | 178.0 | 178.5 | 179.5 | 179.5 | 179.5 | 179.0 | 178.5 |
| Statistics | | | | | | | |
| Min | 177.5 | 178.5 | 178.5 | 178.0 | 179.0 | 179.0 | 178.0 |
| Max | 178.5 | 179.0 | 179.5 | 179.5 | 180.0 | 179.5 | 179.0 |
| Average | 177.9 | 178.7 | 179.1 | 178.8 | 179.4 | 179.2 | 178.5 |
| Sigma | 0.4 | 0.2 | 0.4 | 0.6 | 0.4 | 0.2 | 0.3 |
| (Vce) Lot WorstCase | 176.8 | 178.0 | 178.0 | 177.0 | 178.3 | 178.5 | 177.6 |

**Drift Calculation**

| Vceo | 0 kRad | 26.3 kRad | 52.2 kRad | 78.1 kRad | 108.6 kRad | 24 Hours | 168 Hours |
|---|---|---|---|---|---|---|---|
| On samples | | | | | | | |
| SN2 | - | 1.50E+00 | 1.50E+00 | 1.00E+00 | 2.00E+00 | 1.50E+00 | 1.00E+00 |
| SN3 | - | 1.00E+00 | 1.50E+00 | 500.00E-03 | 1.50E+00 | 2.00E+00 | 1.00E+00 |
| SN4 | - | 500.00E-03 | 1.00E+00 | 1.00E+00 | 1.50E+00 | 1.00E+00 | 500.00E-03 |
| SN6 | - | 500.00E-03 | 500.00E-03 | 500.00E-03 | 1.00E+00 | 1.00E+00 | 0.00E+00 |
| SN7 | - | 500.00E-03 | 1.50E+00 | 1.50E+00 | 1.50E+00 | 1.00E+00 | 500.00E-03 |
| Average | - | 800.00E-03 | 1.20E+00 | 900.00E-03 | 1.50E+00 | 1.30E+00 | 600.00E-03 |
| Sigma | - | 400.00E-03 | 400.00E-03 | 374.17E-03 | 316.23E-03 | 400.00E-03 | 374.17E-03 |
| d(Vce) Lot WorstCase | - | -400.00E-03 | -277.56E-18 | -222.50E-03 | 551.32E-03 | 100.00E-03 | -522.50E-03 |

**Test conditions : TID**
**Parameter : Collector to emitter cut-off current : Iceo**
**Vce = 80V**
Unit : A
Spec Limit Max : 10.00E-03
Spec limits are represented in bold lines on the graphic.



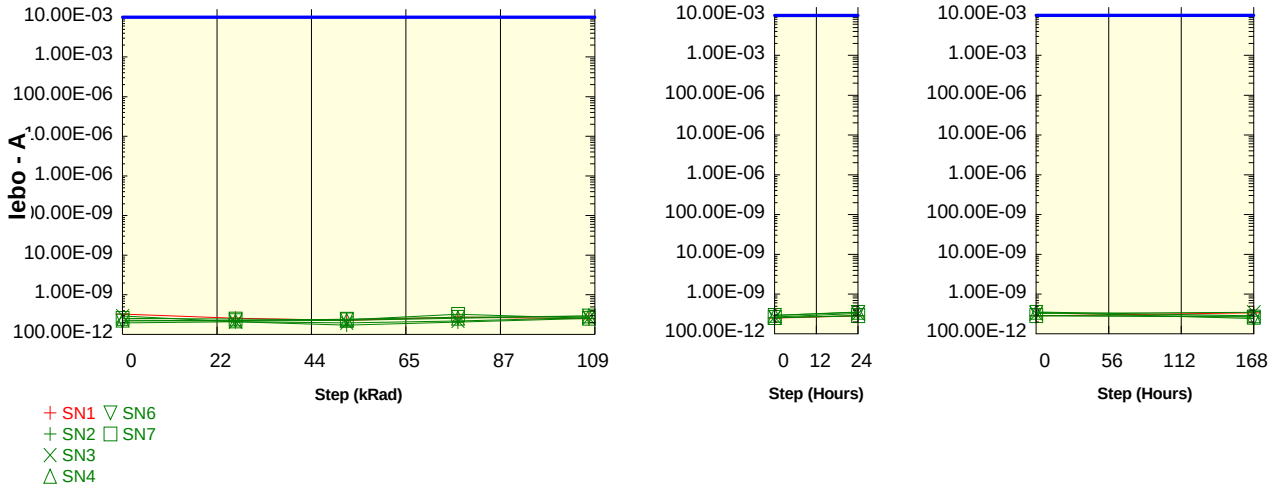

**Measurements**

| Iceo | 0 kRad | 26.3 kRad | 52.2 kRad | 78.1 kRad | 108.6 kRad | 24 Hours | 168 Hours |
|---|---|---|---|---|---|---|---|
| SN1_REF | 17.38E-09 | 14.53E-09 | 14.65E-09 | 15.04E-09 | 110.64E-09 | 18.61E-09 | 141.68E-09 |
| On samples | | | | | | | |
| SN2 | 41.99E-09 | 143.26E-09 | 16.37E-09 | 12.92E-09 | 33.09E-09 | 14.42E-09 | 146.66E-09 |
| SN3 | 23.01E-06 | 22.55E-06 | 22.41E-06 | 22.10E-06 | 22.00E-06 | 21.85E-06 | 22.46E-06 |
| SN4 | 4.93E-06 | 4.59E-06 | 4.46E-06 | 4.32E-06 | 4.39E-06 | 1.57E-06 | 4.69E-06 |
| SN6 | 331.36E-09 | 245.56E-09 | 361.62E-09 | 325.74E-09 | 365.88E-09 | 321.46E-09 | 354.64E-09 |
| SN7 | 34.63E-09 | 106.02E-09 | 19.35E-09 | 40.35E-09 | 33.42E-09 | 13.86E-09 | 139.56E-09 |
| Statistics | | | | | | | |
| Min | 34.63E-09 | 106.02E-09 | 16.37E-09 | 12.92E-09 | 33.09E-09 | 13.86E-09 | 139.56E-09 |
| Max | 23.01E-06 | 22.55E-06 | 22.41E-06 | 22.10E-06 | 22.00E-06 | 21.85E-06 | 22.46E-06 |
| Average | 5.67E-06 | 5.53E-06 | 5.45E-06 | 5.36E-06 | 5.37E-06 | 4.75E-06 | 5.56E-06 |
| Sigma | 8.87E-06 | 8.68E-06 | 8.64E-06 | 8.53E-06 | 8.48E-06 | 8.57E-06 | 8.63E-06 |
| (Ice) Lot WorstCase | 32.28E-06 | 31.57E-06 | 31.38E-06 | 30.94E-06 | 30.81E-06 | 30.46E-06 | 31.44E-06 |

**Drift Calculation**

| Iceo | 0 kRad | 26.3 kRad | 52.2 kRad | 78.1 kRad | 108.6 kRad | 24 Hours | 168 Hours |
|---|---|---|---|---|---|---|---|
| On samples | | | | | | | |
| SN2 | - | 101.27E-09 | -25.62E-09 | -29.07E-09 | -8.90E-09 | -27.57E-09 | 104.67E-09 |
| SN3 | - | -464.00E-09 | -606.00E-09 | -914.00E-09 | -1.01E-06 | -1.16E-06 | -556.00E-09 |
| SN4 | - | -335.60E-09 | -470.60E-09 | -603.80E-09 | -531.60E-09 | -3.35E-06 | -236.20E-09 |
| SN6 | - | -85.80E-09 | 30.26E-09 | -5.62E-09 | 34.52E-09 | -9.90E-09 | 23.28E-09 |
| SN7 | - | 71.39E-09 | -15.27E-09 | 5.72E-09 | -1.21E-09 | -20.76E-09 | 104.93E-09 |
| Average | - | -142.55E-09 | -217.45E-09 | -309.35E-09 | -303.84E-09 | -915.13E-09 | -111.86E-09 |
| Sigma | - | 223.18E-09 | 266.12E-09 | 380.10E-09 | 411.44E-09 | 1.30E-06 | 254.90E-09 |
| d(Ice) Lot WorstCase | - | 526.98E-09 | 580.90E-09 | 830.95E-09 | 930.49E-09 | 2.98E-06 | 652.83E-09 |

**Test conditions : TID**
**Parameter : Emitter to base cut-off current : Iebo**
**Veb = 7V**
Unit : A
Spec Limit Max : 10.00E-03
Spec limits are represented in bold lines on the graphic.



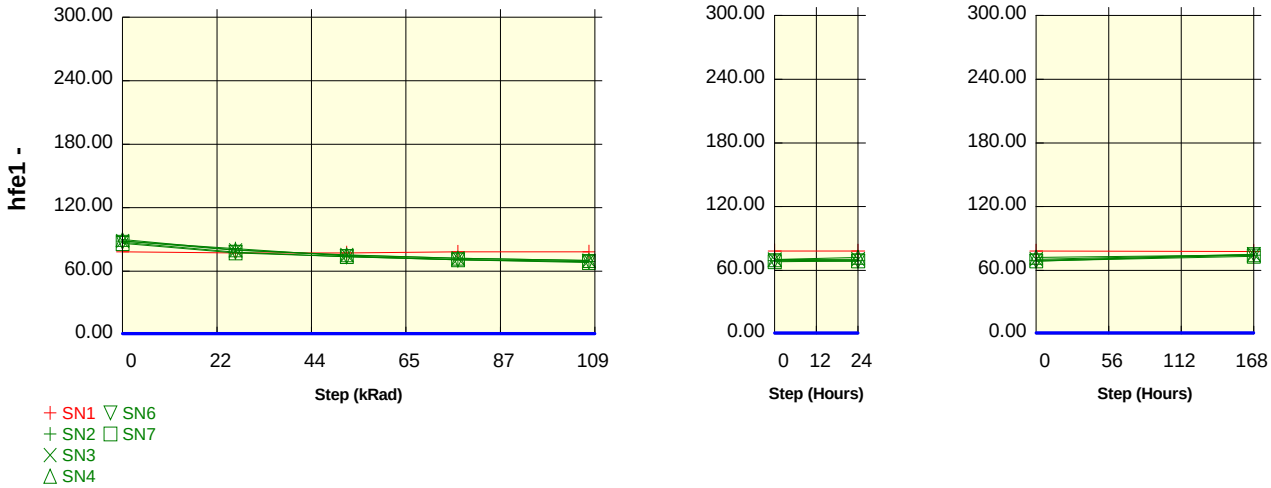

**Measurements**

| Iebo | 0 kRad | 26.3 kRad | 52.2 kRad | 78.1 kRad | 108.6 kRad | 24 Hours | 168 Hours |
|---|---|---|---|---|---|---|---|
| SN1_REF | 326.96E-12 | 257.30E-12 | 226.00E-12 | 276.26E-12 | 249.60E-12 | 284.00E-12 | 336.80E-12 |
| On samples | | | | | | | |
| SN2 | 195.88E-12 | 210.08E-12 | 173.18E-12 | 207.36E-12 | 254.80E-12 | 287.00E-12 | 278.20E-12 |
| SN3 | 293.80E-12 | 209.14E-12 | 197.36E-12 | 221.10E-12 | 265.20E-12 | 326.00E-12 | 351.00E-12 |
| SN4 | 230.30E-12 | 220.58E-12 | 228.14E-12 | 260.18E-12 | 295.80E-12 | 353.90E-12 | 286.60E-12 |
| SN6 | 218.62E-12 | 223.94E-12 | 241.02E-12 | 269.68E-12 | 291.80E-12 | 350.20E-12 | 244.20E-12 |
| SN7 | 254.54E-12 | 246.88E-12 | 235.28E-12 | 320.68E-12 | 259.20E-12 | 291.00E-12 | 265.40E-12 |
| Statistics | | | | | | | |
| Min | 195.88E-12 | 209.14E-12 | 173.18E-12 | 207.36E-12 | 254.80E-12 | 287.00E-12 | 244.20E-12 |
| Max | 293.80E-12 | 246.88E-12 | 241.02E-12 | 320.68E-12 | 295.80E-12 | 353.90E-12 | 351.00E-12 |
| Average | 238.63E-12 | 222.12E-12 | 215.00E-12 | 255.80E-12 | 273.36E-12 | 321.62E-12 | 285.08E-12 |
| Sigma | 33.45E-12 | 13.65E-12 | 25.77E-12 | 39.93E-12 | 17.06E-12 | 28.33E-12 | 35.93E-12 |
| (Ieb) Lot WorstCase | 338.98E-12 | 263.09E-12 | 292.31E-12 | 375.59E-12 | 324.54E-12 | 406.62E-12 | 392.86E-12 |

**Drift Calculation**

| Iebo | 0 kRad | 26.3 kRad | 52.2 kRad | 78.1 kRad | 108.6 kRad | 24 Hours | 168 Hours |
|---|---|---|---|---|---|---|---|
| On samples | | | | | | | |
| SN2 | - | 14.20E-12 | -22.70E-12 | 11.48E-12 | 58.92E-12 | 91.12E-12 | 82.32E-12 |
| SN3 | - | -84.66E-12 | -96.44E-12 | -72.70E-12 | -28.60E-12 | 32.20E-12 | 57.20E-12 |
| SN4 | - | -9.72E-12 | -2.16E-12 | 29.88E-12 | 65.50E-12 | 123.60E-12 | 56.30E-12 |
| SN6 | - | 5.32E-12 | 22.40E-12 | 51.06E-12 | 73.18E-12 | 131.58E-12 | 25.58E-12 |
| SN7 | - | -7.66E-12 | -19.26E-12 | 66.14E-12 | 4.66E-12 | 36.46E-12 | 10.86E-12 |
| Average | - | -16.50E-12 | -23.63E-12 | 17.17E-12 | 34.73E-12 | 82.99E-12 | 46.45E-12 |
| Sigma | - | 35.18E-12 | 39.75E-12 | 48.62E-12 | 39.81E-12 | 42.00E-12 | 25.30E-12 |
| d(Ieb) Lot WorstCase | - | 89.04E-12 | 95.62E-12 | 163.02E-12 | 154.17E-12 | 209.00E-12 | 122.36E-12 |

**Test conditions : TID**
**Parameter : Forward-Current Transfer Ratio 1 : hfe1**
**Vce = 2V Ic = 100µA**
Unit :
Spec Limit Min : 1.00
Spec limits are represented in bold lines on the graphic.



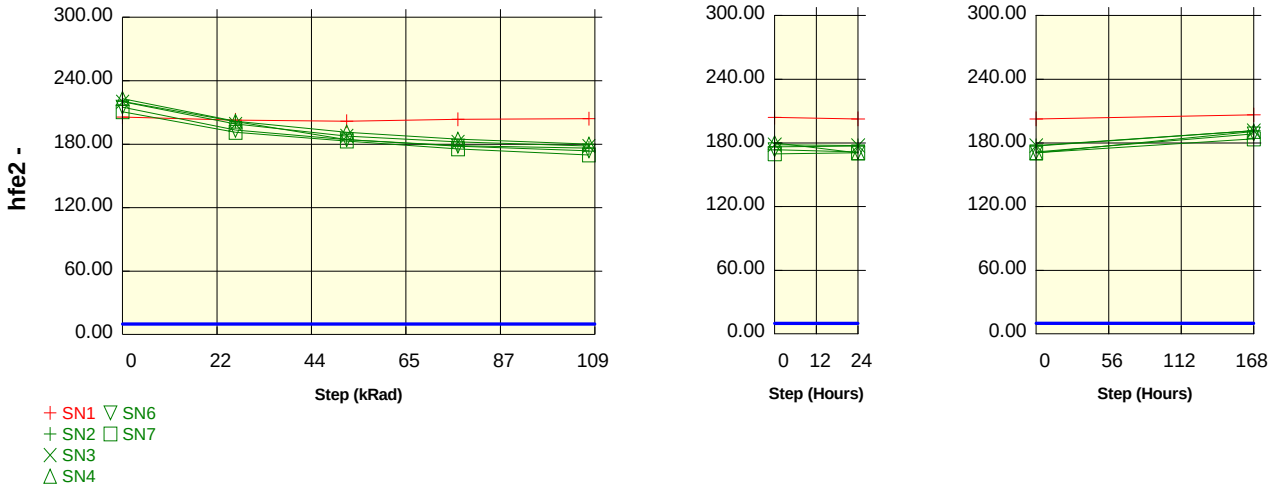

**Measurements**

| hfe1 | 0 kRad | 26.3 kRad | 52.2 kRad | 78.1 kRad | 108.6 kRad | 24 Hours | 168 Hours |
|---|---|---|---|---|---|---|---|
| SN1_REF | 78.26 | 77.22 | 77.20 | 78.09 | 78.25 | 78.03 | 77.74 |
| On samples | | | | | | | |
| SN2 | 88.37 | 81.29 | 74.34 | 70.97 | 69.15 | 69.29 | 74.35 |
| SN3 | 88.53 | 79.60 | 75.11 | 72.10 | 70.13 | 70.33 | 75.00 |
| SN4 | 89.89 | 79.99 | 75.36 | 72.12 | 69.99 | 72.28 | 74.47 |
| SN6 | 87.34 | 77.94 | 73.56 | 70.50 | 68.89 | 68.61 | 74.80 |
| SN7 | 86.14 | 77.24 | 73.75 | 70.67 | 68.04 | 68.83 | 73.32 |
| Statistics | | | | | | | |
| Min | 86.14 | 77.24 | 73.56 | 70.50 | 68.04 | 68.61 | 73.32 |
| Max | 89.89 | 81.29 | 75.36 | 72.12 | 70.13 | 72.28 | 75.00 |
| Average | 88.05 | 79.21 | 74.43 | 71.27 | 69.24 | 69.87 | 74.39 |
| Sigma | 1.26 | 1.45 | 0.72 | 0.70 | 0.76 | 1.34 | 0.58 |
| (hfe) Lot WorstCase | 84.29 | 74.86 | 72.28 | 69.17 | 66.95 | 65.84 | 72.64 |

**Drift Calculation**

| hfe1 | 0 kRad | 26.3 kRad | 52.2 kRad | 78.1 kRad | 108.6 kRad | 24 Hours | 168 Hours |
|---|---|---|---|---|---|---|---|
| On samples | | | | | | | |
| SN2 | - | 985.35E-06 | 2.13E-03 | 2.77E-03 | 3.14E-03 | 3.12E-03 | 2.13E-03 |
| SN3 | - | 1.27E-03 | 2.02E-03 | 2.57E-03 | 2.96E-03 | 2.92E-03 | 2.04E-03 |
| SN4 | - | 1.38E-03 | 2.14E-03 | 2.74E-03 | 3.16E-03 | 2.71E-03 | 2.30E-03 |
| SN6 | - | 1.38E-03 | 2.14E-03 | 2.73E-03 | 3.07E-03 | 3.12E-03 | 1.92E-03 |
| SN7 | - | 1.34E-03 | 1.95E-03 | 2.54E-03 | 3.09E-03 | 2.92E-03 | 2.03E-03 |
| Average | - | 1.27E-03 | 2.08E-03 | 2.67E-03 | 3.09E-03 | 2.96E-03 | 2.08E-03 |
| Sigma | - | 147.75E-06 | 79.79E-06 | 95.64E-06 | 70.43E-06 | 152.48E-06 | 129.14E-06 |
| d(1/hfe) Lot WorstCase | - | 1.71E-03 | 2.32E-03 | 2.96E-03 | 3.30E-03 | 3.42E-03 | 2.47E-03 |

**Test conditions : TID**
**Parameter : Forward-Current Transfer Ratio 2 : hfe2**
**Vce = 2V Ic = 1mA**
Unit :
Spec Limit Min : 10.00
Spec limits are represented in bold lines on the graphic.



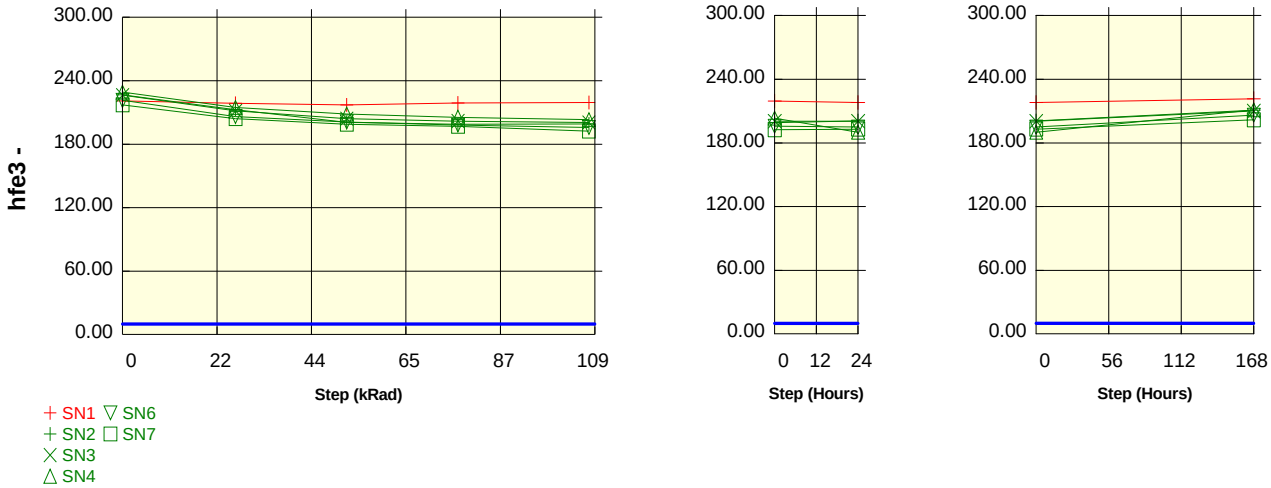

**Measurements**

| hfe2 | 0 kRad | 26.3 kRad | 52.2 kRad | 78.1 kRad | 108.6 kRad | 24 Hours | 168 Hours |
|---|---|---|---|---|---|---|---|
| SN1_REF | 205.71 | 202.90 | 201.80 | 203.62 | 204.15 | 202.64 | 206.35 |
| On samples | | | | | | | |
| SN2 | 220.36 | 201.59 | 184.20 | 178.53 | 176.35 | 177.14 | 191.46 |
| SN3 | 220.13 | 199.05 | 187.78 | 182.24 | 178.33 | 177.58 | 191.48 |
| SN4 | 223.16 | 201.74 | 191.41 | 184.85 | 180.02 | 170.48 | 190.91 |
| SN6 | 214.94 | 193.33 | 184.28 | 178.14 | 173.60 | 171.48 | 188.48 |
| SN7 | 210.51 | 191.24 | 183.02 | 175.56 | 169.87 | 170.79 | 183.91 |
| Statistics | | | | | | | |
| Min | 210.51 | 191.24 | 183.02 | 175.56 | 169.87 | 170.48 | 183.91 |
| Max | 223.16 | 201.74 | 191.41 | 184.85 | 180.02 | 177.58 | 191.48 |
| Average | 217.82 | 197.39 | 186.14 | 179.86 | 175.64 | 173.50 | 189.25 |
| Sigma | 4.52 | 4.33 | 3.08 | 3.28 | 3.59 | 3.18 | 2.89 |
| (hfe) Lot WorstCase | 204.27 | 184.41 | 176.90 | 170.02 | 164.87 | 163.97 | 180.58 |

**Drift Calculation**

| hfe2 | 0 kRad | 26.3 kRad | 52.2 kRad | 78.1 kRad | 108.6 kRad | 24 Hours | 168 Hours |
|---|---|---|---|---|---|---|---|
| On samples | | | | | | | |
| SN2 | - | 422.51E-06 | 891.01E-06 | 1.06E-03 | 1.13E-03 | 1.11E-03 | 684.97E-06 |
| SN3 | - | 481.20E-06 | 782.81E-06 | 944.49E-06 | 1.06E-03 | 1.09E-03 | 679.92E-06 |
| SN4 | - | 475.80E-06 | 743.22E-06 | 928.76E-06 | 1.07E-03 | 1.38E-03 | 756.92E-06 |
| SN6 | - | 519.92E-06 | 773.99E-06 | 960.98E-06 | 1.11E-03 | 1.18E-03 | 653.05E-06 |
| SN7 | - | 478.74E-06 | 713.55E-06 | 945.93E-06 | 1.14E-03 | 1.10E-03 | 687.17E-06 |
| Average | - | 475.63E-06 | 780.92E-06 | 968.69E-06 | 1.10E-03 | 1.17E-03 | 692.41E-06 |
| Sigma | - | 31.06E-06 | 60.22E-06 | 48.39E-06 | 29.42E-06 | 110.40E-06 | 34.49E-06 |
| d(1/hfe) Lot WorstCase | - | 568.82E-06 | 961.57E-06 | 1.11E-03 | 1.19E-03 | 1.50E-03 | 795.89E-06 |

**Test conditions : TID**
**Parameter : Forward-Current Transfer Ratio 3 : hfe3**
**Vce = 2V Ic = 10mA**
Unit :
Spec Limit Min : 10.00
Spec limits are represented in bold lines on the graphic.



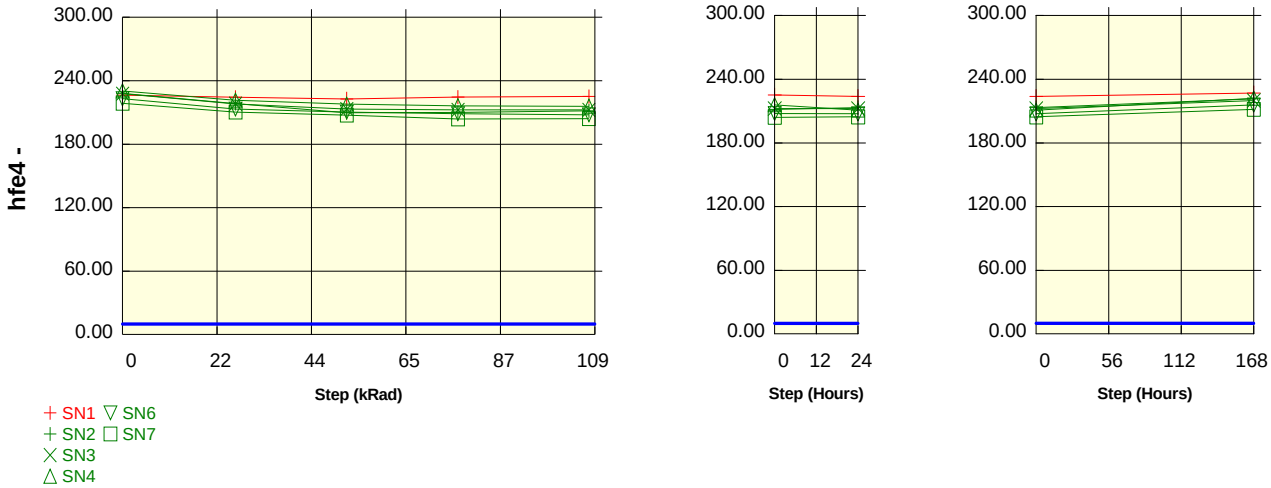

**Measurements**

| hfe3 | 0 kRad | 26.3 kRad | 52.2 kRad | 78.1 kRad | 108.6 kRad | 24 Hours | 168 Hours |
|---|---|---|---|---|---|---|---|
| SN1_REF | 220.96 | 218.66 | 217.09 | 218.91 | 219.46 | 218.19 | 221.61 |
| On samples | | | | | | | |
| SN2 | 226.60 | 212.69 | 200.74 | 198.89 | 199.17 | 200.66 | 210.97 |
| SN3 | 226.39 | 211.55 | 204.15 | 201.82 | 200.44 | 200.46 | 209.99 |
| SN4 | 229.23 | 214.69 | 208.51 | 205.46 | 203.31 | 190.09 | 211.10 |
| SN6 | 221.44 | 206.27 | 201.05 | 198.04 | 195.75 | 194.90 | 206.15 |
| SN7 | 217.15 | 204.17 | 198.93 | 196.77 | 192.46 | 192.97 | 201.84 |
| Statistics | | | | | | | |
| Min | 217.15 | 204.17 | 198.93 | 196.77 | 192.46 | 190.09 | 201.84 |
| Max | 229.23 | 214.69 | 208.51 | 205.46 | 203.31 | 200.66 | 211.10 |
| Average | 224.16 | 209.87 | 202.67 | 200.20 | 198.23 | 195.82 | 208.01 |
| Sigma | 4.32 | 3.98 | 3.37 | 3.11 | 3.77 | 4.17 | 3.57 |
| (hfe) Lot WorstCase | 211.21 | 197.92 | 192.58 | 190.86 | 186.91 | 183.32 | 197.29 |

**Drift Calculation**

| hfe3 | 0 kRad | 26.3 kRad | 52.2 kRad | 78.1 kRad | 108.6 kRad | 24 Hours | 168 Hours |
|---|---|---|---|---|---|---|---|
| On samples | | | | | | | |
| SN2 | - | 288.71E-06 | 568.53E-06 | 614.92E-06 | 607.65E-06 | 570.54E-06 | 326.93E-06 |
| SN3 | - | 309.79E-06 | 481.21E-06 | 537.76E-06 | 571.84E-06 | 571.24E-06 | 345.04E-06 |
| SN4 | - | 295.48E-06 | 433.57E-06 | 504.68E-06 | 556.05E-06 | 898.25E-06 | 374.64E-06 |
| SN6 | - | 332.01E-06 | 457.99E-06 | 533.58E-06 | 592.74E-06 | 614.82E-06 | 334.81E-06 |
| SN7 | - | 292.67E-06 | 421.84E-06 | 476.90E-06 | 590.82E-06 | 577.09E-06 | 349.40E-06 |
| Average | - | 303.73E-06 | 472.63E-06 | 533.57E-06 | 583.82E-06 | 646.39E-06 | 346.17E-06 |
| Sigma | - | 15.83E-06 | 52.13E-06 | 46.22E-06 | 17.95E-06 | 126.99E-06 | 16.26E-06 |
| d(1/hfe) Lot WorstCase | - | 351.21E-06 | 629.03E-06 | 672.23E-06 | 637.67E-06 | 1.03E-03 | 394.93E-06 |

**Test conditions : TID**
**Parameter : Forward-Current Transfer Ratio 4 : hfe4**
**Vce = 2V Ic = 100mA**
Unit :
Spec Limit Min : 10.00
Spec limits are represented in bold lines on the graphic.



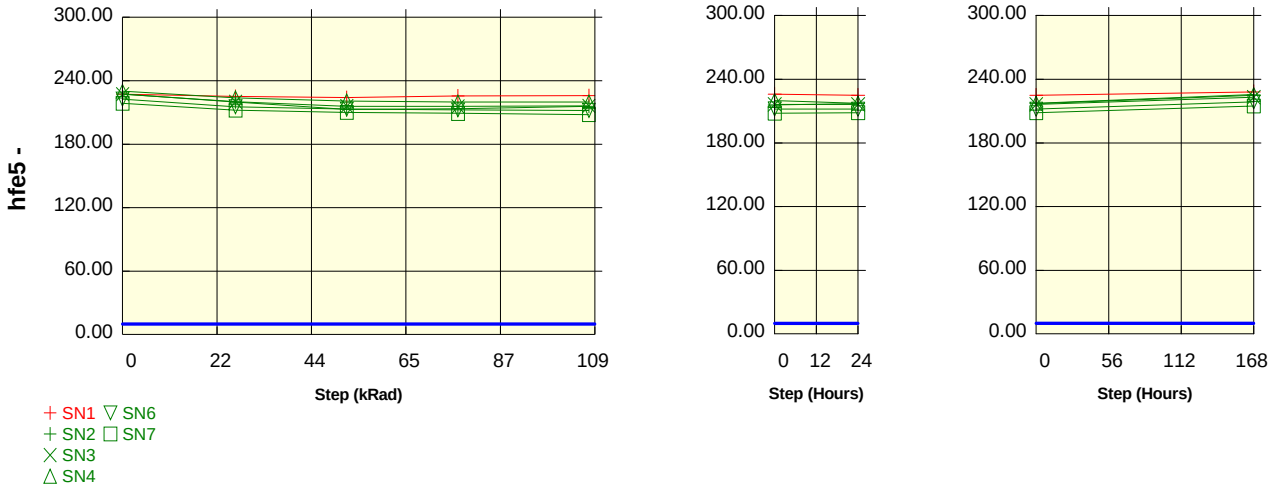

**Measurements**

| hfe4 | 0 kRad | 26.3 kRad | 52.2 kRad | 78.1 kRad | 108.6 kRad | 24 Hours | 168 Hours |
|---|---|---|---|---|---|---|---|
| SN1_REF | 226.52 | 224.31 | 222.92 | 224.52 | 225.04 | 223.80 | 227.06 |
| On samples | | | | | | | |
| SN2 | 227.96 | 218.35 | 209.92 | 209.96 | 211.55 | 213.07 | 221.52 |
| SN3 | 227.81 | 218.23 | 213.17 | 212.36 | 212.38 | 212.37 | 219.93 |
| SN4 | 230.44 | 221.60 | 217.82 | 216.43 | 215.90 | 210.91 | 222.13 |
| SN6 | 222.97 | 213.24 | 210.37 | 208.82 | 207.79 | 207.35 | 215.66 |
| SN7 | 218.74 | 210.38 | 207.53 | 203.85 | 204.19 | 204.52 | 211.58 |
| Statistics | | | | | | | |
| Min | 218.74 | 210.38 | 207.53 | 203.85 | 204.19 | 204.52 | 211.58 |
| Max | 230.44 | 221.60 | 217.82 | 216.43 | 215.90 | 213.07 | 222.13 |
| Average | 225.59 | 216.36 | 211.77 | 210.28 | 210.36 | 209.64 | 218.16 |
| Sigma | 4.19 | 4.01 | 3.52 | 4.14 | 4.02 | 3.23 | 3.99 |
| (hfe) Lot WorstCase | 213.01 | 204.33 | 201.21 | 197.86 | 198.29 | 199.95 | 206.18 |

**Drift Calculation**

| hfe4 | 0 kRad | 26.3 kRad | 52.2 kRad | 78.1 kRad | 108.6 kRad | 24 Hours | 168 Hours |
|---|---|---|---|---|---|---|---|
| On samples | | | | | | | |
| SN2 | - | 193.07E-06 | 376.97E-06 | 376.09E-06 | 340.40E-06 | 306.62E-06 | 127.68E-06 |
| SN3 | - | 192.85E-06 | 301.43E-06 | 319.34E-06 | 318.91E-06 | 319.16E-06 | 157.37E-06 |
| SN4 | - | 173.04E-06 | 251.32E-06 | 280.96E-06 | 292.15E-06 | 401.94E-06 | 162.28E-06 |
| SN6 | - | 204.58E-06 | 268.58E-06 | 303.99E-06 | 327.65E-06 | 337.78E-06 | 151.96E-06 |
| SN7 | - | 181.64E-06 | 246.94E-06 | 334.10E-06 | 325.88E-06 | 317.89E-06 | 154.85E-06 |
| Average | - | 189.03E-06 | 289.05E-06 | 322.90E-06 | 321.00E-06 | 336.68E-06 | 150.83E-06 |
| Sigma | - | 10.80E-06 | 47.96E-06 | 31.89E-06 | 16.01E-06 | 34.13E-06 | 12.06E-06 |
| d(1/hfe) Lot WorstCase | - | 221.43E-06 | 432.91E-06 | 418.55E-06 | 369.02E-06 | 439.06E-06 | 187.01E-06 |

**Test conditions : TID**
**Parameter : Forward-Current Transfer Ratio 5 : hfe5**
**Vce = 2V Ic = 500mA**
Unit :
Spec Limit Min : 10.00
Spec limits are represented in bold lines on the graphic.



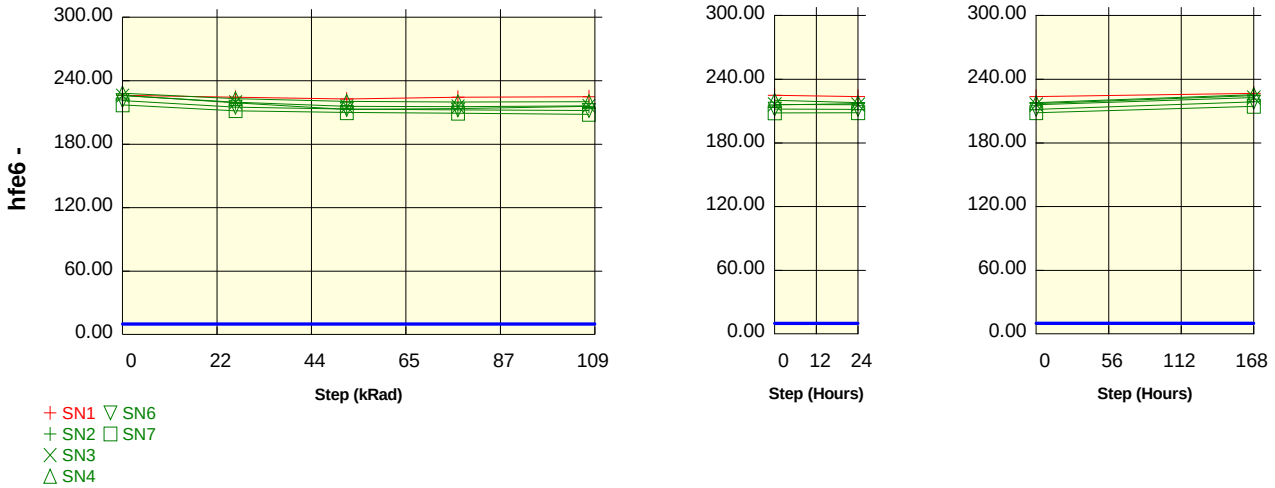

**Measurements**

| hfe5 | 0 kRad | 26.3 kRad | 52.2 kRad | 78.1 kRad | 108.6 kRad | 24 Hours | 168 Hours |
|---|---|---|---|---|---|---|---|
| SN1_REF | 227.33 | 225.21 | 223.98 | 225.55 | 225.97 | 224.95 | 228.11 |
| On samples | | | | | | | |
| SN2 | 227.45 | 220.03 | 212.82 | 213.56 | 215.72 | 217.16 | 224.93 |
| SN3 | 227.27 | 220.10 | 215.89 | 215.69 | 216.28 | 216.25 | 223.01 |
| SN4 | 230.13 | 223.89 | 220.86 | 219.93 | 219.99 | 217.48 | 225.61 |
| SN6 | 222.68 | 215.38 | 213.23 | 212.36 | 211.97 | 211.80 | 218.68 |
| SN7 | 218.59 | 212.22 | 210.12 | 209.18 | 208.09 | 208.48 | 214.78 |
| Statistics | | | | | | | |
| Min | 218.59 | 212.22 | 210.12 | 209.18 | 208.09 | 208.48 | 214.78 |
| Max | 230.13 | 223.89 | 220.86 | 219.93 | 219.99 | 217.48 | 225.61 |
| Average | 225.22 | 218.32 | 214.58 | 214.14 | 214.41 | 214.23 | 221.40 |
| Sigma | 4.09 | 4.07 | 3.63 | 3.58 | 4.05 | 3.53 | 4.10 |
| (hfe) Lot WorstCase | 212.95 | 206.11 | 203.69 | 203.40 | 202.25 | 203.65 | 209.10 |

**Drift Calculation**

| hfe5 | 0 kRad | 26.3 kRad | 52.2 kRad | 78.1 kRad | 108.6 kRad | 24 Hours | 168 Hours |
|---|---|---|---|---|---|---|---|
| On samples | | | | | | | |
| SN2 | - | 148.25E-06 | 302.08E-06 | 285.82E-06 | 238.96E-06 | 208.21E-06 | 49.07E-06 |
| SN3 | - | 143.43E-06 | 231.99E-06 | 236.22E-06 | 223.58E-06 | 224.42E-06 | 84.23E-06 |
| SN4 | - | 121.04E-06 | 182.47E-06 | 201.59E-06 | 200.33E-06 | 252.75E-06 | 87.08E-06 |
| SN6 | - | 152.09E-06 | 199.04E-06 | 218.25E-06 | 226.82E-06 | 230.68E-06 | 81.99E-06 |
| SN7 | - | 137.30E-06 | 184.46E-06 | 205.97E-06 | 230.83E-06 | 221.89E-06 | 81.29E-06 |
| Average | - | 140.42E-06 | 220.01E-06 | 229.57E-06 | 224.10E-06 | 227.59E-06 | 76.73E-06 |
| Sigma | - | 10.88E-06 | 44.70E-06 | 30.58E-06 | 12.95E-06 | 14.56E-06 | 13.98E-06 |
| d(1/hfe) Lot WorstCase | - | 173.06E-06 | 354.12E-06 | 321.32E-06 | 262.97E-06 | 271.28E-06 | 118.67E-06 |

**Test conditions : TID**
**Parameter : Forward-Current Transfer Ratio 6 : hfe6**
**Vce = 2V Ic = 1A**
Unit :
Spec Limit Min : 10.00
Spec limits are represented in bold lines on the graphic.



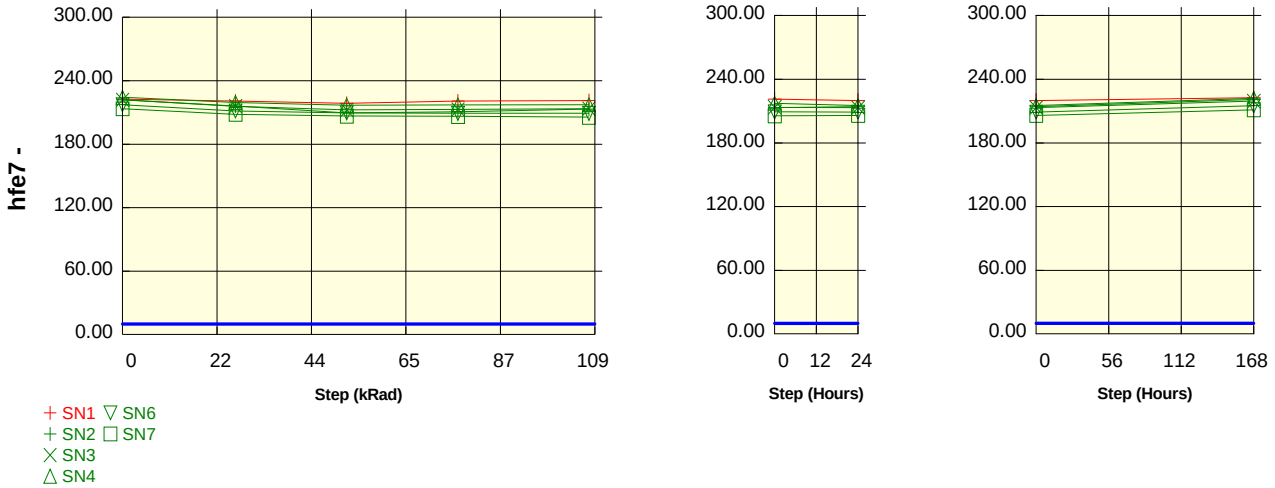

**Measurements**

| hfe6 | 0 kRad | 26.3 kRad | 52.2 kRad | 78.1 kRad | 108.6 kRad | 24 Hours | 168 Hours |
|---|---|---|---|---|---|---|---|
| SN1_REF | 226.31 | 224.27 | 222.77 | 224.38 | 224.89 | 223.65 | 226.80 |
| On samples | | | | | | | |
| SN2 | 226.12 | 219.25 | 212.81 | 213.70 | 215.80 | 217.06 | 224.61 |
| SN3 | 225.93 | 219.58 | 215.71 | 215.65 | 216.33 | 216.09 | 222.85 |
| SN4 | 228.40 | 223.09 | 220.45 | 219.92 | 220.12 | 217.84 | 225.53 |
| SN6 | 221.21 | 214.96 | 213.11 | 212.35 | 211.89 | 211.66 | 218.53 |
| SN7 | 217.16 | 211.74 | 209.95 | 209.40 | 208.20 | 208.45 | 214.56 |
| Statistics | | | | | | | |
| Min | 217.16 | 211.74 | 209.95 | 209.40 | 208.20 | 208.45 | 214.56 |
| Max | 228.40 | 223.09 | 220.45 | 219.92 | 220.12 | 217.84 | 225.53 |
| Average | 223.76 | 217.73 | 214.41 | 214.21 | 214.47 | 214.22 | 221.21 |
| Sigma | 4.05 | 3.95 | 3.53 | 3.51 | 4.08 | 3.59 | 4.11 |
| (hfe) Lot WorstCase | 211.63 | 205.87 | 203.81 | 203.68 | 202.23 | 203.45 | 208.90 |

**Drift Calculation**

| hfe6 | 0 kRad | 26.3 kRad | 52.2 kRad | 78.1 kRad | 108.6 kRad | 24 Hours | 168 Hours |
|---|---|---|---|---|---|---|---|
| On samples | | | | | | | |
| SN2 | - | 138.55E-06 | 276.68E-06 | 257.00E-06 | 211.62E-06 | 184.54E-06 | 29.75E-06 |
| SN3 | - | 127.81E-06 | 209.59E-06 | 210.96E-06 | 196.28E-06 | 201.43E-06 | 61.14E-06 |
| SN4 | - | 104.11E-06 | 157.78E-06 | 168.72E-06 | 164.58E-06 | 212.23E-06 | 55.67E-06 |
| SN6 | - | 131.46E-06 | 171.77E-06 | 188.53E-06 | 198.84E-06 | 203.88E-06 | 55.47E-06 |
| SN7 | - | 117.86E-06 | 158.17E-06 | 170.56E-06 | 198.27E-06 | 192.34E-06 | 55.77E-06 |
| Average | - | 123.96E-06 | 194.80E-06 | 199.15E-06 | 193.92E-06 | 198.88E-06 | 51.56E-06 |
| Sigma | - | 11.96E-06 | 45.09E-06 | 32.69E-06 | 15.64E-06 | 9.57E-06 | 11.11E-06 |
| d(1/hfe) Lot WorstCase | - | 159.84E-06 | 330.07E-06 | 297.22E-06 | 240.83E-06 | 227.60E-06 | 84.90E-06 |

**Test conditions : TID**
**Parameter : Forward-Current Transfer Ratio 7 : hfe7**
**Vce = 2V Ic = 2A**
Unit :
Spec Limit Min : 10.00
Spec limits are represented in bold lines on the graphic.



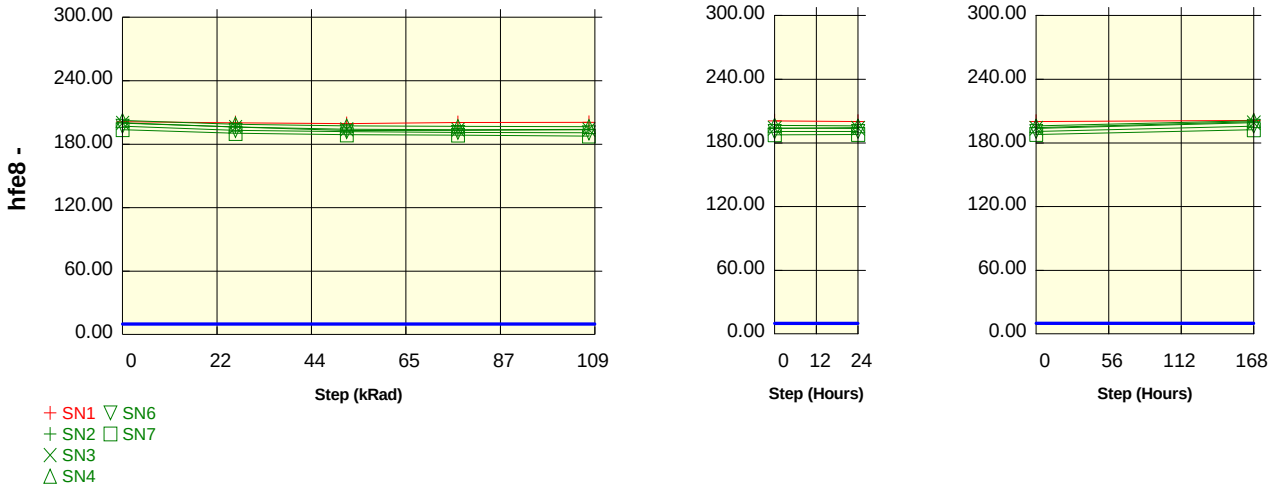

**Measurements**

| hfe7 | 0 kRad | 26.3 kRad | 52.2 kRad | 78.1 kRad | 108.6 kRad | 24 Hours | 168 Hours |
|---|---|---|---|---|---|---|---|
| SN1_REF | 222.56 | 220.70 | 218.60 | 220.71 | 221.18 | 220.00 | 222.51 |
| On samples | | | | | | | |
| SN2 | 222.11 | 215.99 | 209.57 | 210.59 | 213.10 | 214.23 | 220.97 |
| SN3 | 221.92 | 215.89 | 212.31 | 212.91 | 213.52 | 213.20 | 219.30 |
| SN4 | 224.28 | 219.37 | 216.85 | 217.09 | 217.29 | 215.28 | 221.96 |
| SN6 | 217.33 | 211.30 | 209.65 | 209.16 | 209.17 | 209.08 | 215.03 |
| SN7 | 213.38 | 208.22 | 206.56 | 206.34 | 205.56 | 206.03 | 211.21 |
| Statistics | | | | | | | |
| Min | 213.38 | 208.22 | 206.56 | 206.34 | 205.56 | 206.03 | 211.21 |
| Max | 224.28 | 219.37 | 216.85 | 217.09 | 217.29 | 215.28 | 221.96 |
| Average | 219.80 | 214.15 | 210.99 | 211.22 | 211.73 | 211.56 | 217.69 |
| Sigma | 3.93 | 3.92 | 3.45 | 3.63 | 4.02 | 3.48 | 4.01 |
| (hfe) Lot WorstCase | 208.01 | 202.38 | 200.64 | 200.33 | 199.68 | 201.13 | 205.65 |

**Drift Calculation**

| hfe7 | 0 kRad | 26.3 kRad | 52.2 kRad | 78.1 kRad | 108.6 kRad | 24 Hours | 168 Hours |
|---|---|---|---|---|---|---|---|
| On samples | | | | | | | |
| SN2 | - | 127.51E-06 | 269.44E-06 | 246.20E-06 | 190.30E-06 | 165.51E-06 | 23.19E-06 |
| SN3 | - | 125.90E-06 | 203.82E-06 | 190.61E-06 | 177.21E-06 | 184.29E-06 | 53.70E-06 |
| SN4 | - | 99.75E-06 | 152.88E-06 | 147.75E-06 | 143.53E-06 | 186.38E-06 | 46.71E-06 |
| SN6 | - | 131.23E-06 | 168.52E-06 | 179.70E-06 | 179.38E-06 | 181.50E-06 | 49.16E-06 |
| SN7 | - | 116.11E-06 | 154.68E-06 | 159.97E-06 | 178.39E-06 | 167.30E-06 | 48.10E-06 |
| Average | - | 120.10E-06 | 189.87E-06 | 184.85E-06 | 173.76E-06 | 177.00E-06 | 44.17E-06 |
| Sigma | - | 11.34E-06 | 43.79E-06 | 34.11E-06 | 15.83E-06 | 8.80E-06 | 10.75E-06 |
| d(1/hfe) Lot WorstCase | - | 154.11E-06 | 321.24E-06 | 287.19E-06 | 221.24E-06 | 203.40E-06 | 76.43E-06 |

**Test conditions : TID**
**Parameter : Forward-Current Transfer Ratio 8 : hfe8**
**Vce = 2V Ic = 4A**
Unit :
Spec Limit Min : 10.00
Spec limits are represented in bold lines on the graphic.



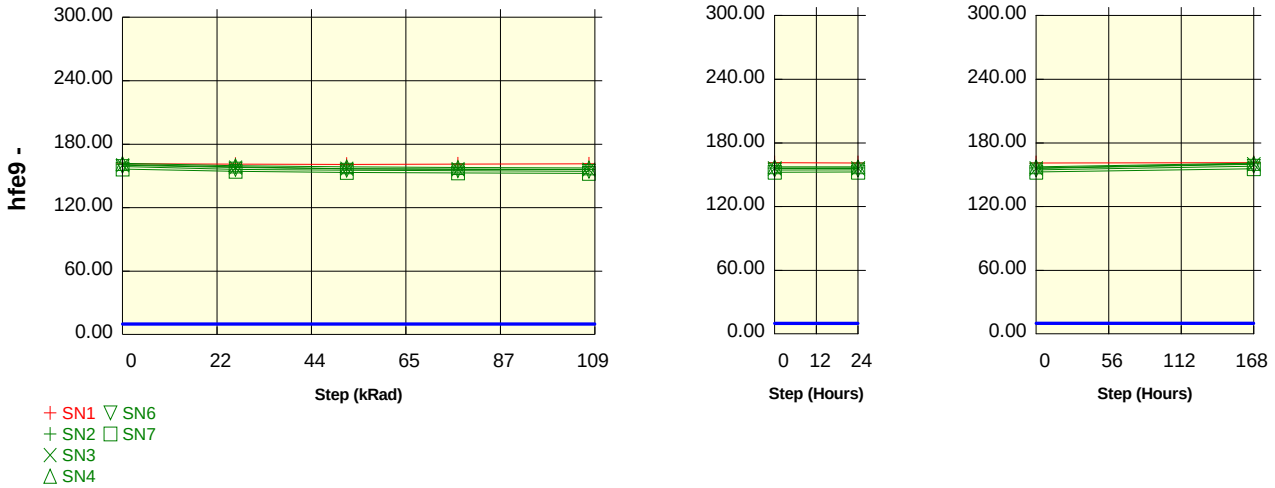

**Measurements**

| hfe8 | 0 kRad | 26.3 kRad | 52.2 kRad | 78.1 kRad | 108.6 kRad | 24 Hours | 168 Hours |
|---|---|---|---|---|---|---|---|
| SN1_REF | 201.13 | 200.27 | 199.50 | 200.37 | 200.60 | 200.06 | 201.35 |
| On samples | | | | | | | |
| SN2 | 200.29 | 196.33 | 192.89 | 193.03 | 193.78 | 194.42 | 199.89 |
| SN3 | 200.01 | 196.25 | 194.09 | 193.71 | 193.84 | 193.80 | 199.01 |
| SN4 | 202.52 | 199.00 | 197.32 | 196.81 | 196.66 | 196.03 | 201.04 |
| SN6 | 196.98 | 193.04 | 191.78 | 191.14 | 190.73 | 190.85 | 195.79 |
| SN7 | 193.63 | 190.20 | 188.91 | 188.47 | 187.66 | 187.95 | 192.46 |
| Statistics | | | | | | | |
| Min | 193.63 | 190.20 | 188.91 | 188.47 | 187.66 | 187.95 | 192.46 |
| Max | 202.52 | 199.00 | 197.32 | 196.81 | 196.66 | 196.03 | 201.04 |
| Average | 198.69 | 194.96 | 193.00 | 192.63 | 192.53 | 192.61 | 197.64 |
| Sigma | 3.08 | 3.04 | 2.76 | 2.77 | 3.07 | 2.87 | 3.12 |
| (hfe) Lot WorstCase | 189.44 | 185.84 | 184.73 | 184.32 | 183.31 | 184.00 | 188.27 |

**Drift Calculation**

| hfe8 | 0 kRad | 26.3 kRad | 52.2 kRad | 78.1 kRad | 108.6 kRad | 24 Hours | 168 Hours |
|---|---|---|---|---|---|---|---|
| On samples | | | | | | | |
| SN2 | - | 100.64E-06 | 191.55E-06 | 187.82E-06 | 167.80E-06 | 150.76E-06 | 9.97E-06 |
| SN3 | - | 95.83E-06 | 152.62E-06 | 162.53E-06 | 159.21E-06 | 160.11E-06 | 25.02E-06 |
| SN4 | - | 87.33E-06 | 130.16E-06 | 143.19E-06 | 147.24E-06 | 163.39E-06 | 36.33E-06 |
| SN6 | - | 103.73E-06 | 137.53E-06 | 155.20E-06 | 166.34E-06 | 163.17E-06 | 30.95E-06 |
| SN7 | - | 93.31E-06 | 129.03E-06 | 141.43E-06 | 164.36E-06 | 156.05E-06 | 31.54E-06 |
| Average | - | 96.17E-06 | 148.18E-06 | 158.03E-06 | 160.99E-06 | 158.70E-06 | 26.76E-06 |
| Sigma | - | 5.72E-06 | 23.26E-06 | 16.80E-06 | 7.47E-06 | 4.78E-06 | 9.13E-06 |
| d(1/hfe) Lot WorstCase | - | 113.32E-06 | 217.97E-06 | 208.44E-06 | 183.39E-06 | 173.02E-06 | 54.16E-06 |

**Test conditions : TID**
**Parameter : Forward-Current Transfer Ratio 9 : hfe9**
**Vce = 2V Ic = 6A**
Unit :
Spec Limit Min : 10.00
Spec limits are represented in bold lines on the graphic.



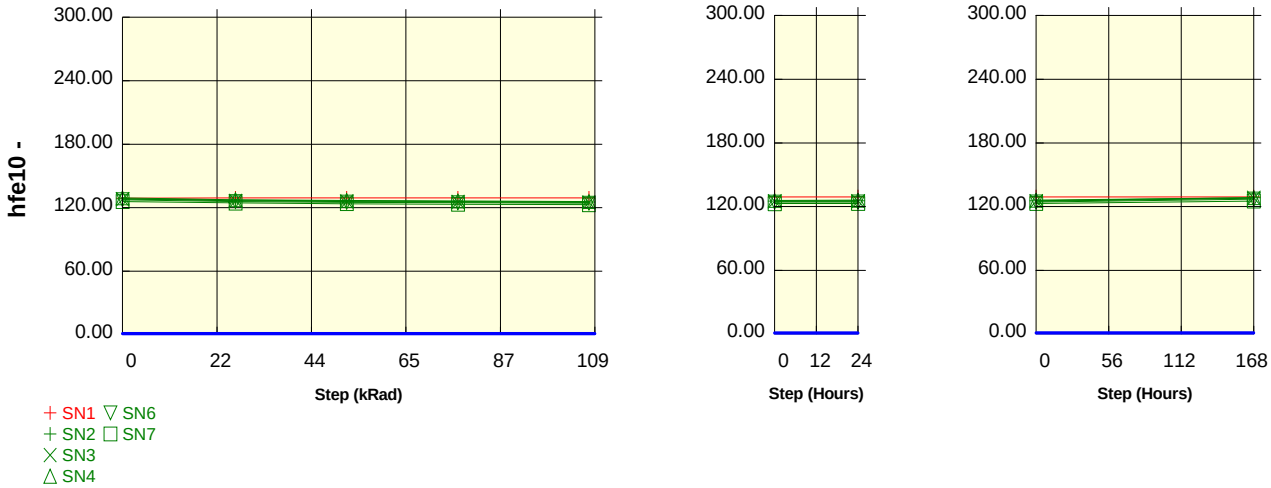

**Measurements**

| hfe9 | 0 kRad | 26.3 kRad | 52.2 kRad | 78.1 kRad | 108.6 kRad | 24 Hours | 168 Hours |
|---|---|---|---|---|---|---|---|
| SN1_REF | 161.33 | 161.20 | 161.02 | 161.26 | 161.32 | 161.19 | 161.40 |
| On samples | | | | | | | |
| SN2 | 160.56 | 158.43 | 156.83 | 156.40 | 156.21 | 156.47 | 160.26 |
| SN3 | 160.12 | 157.93 | 156.81 | 156.32 | 155.93 | 156.01 | 159.82 |
| SN4 | 161.84 | 159.49 | 158.51 | 157.93 | 157.45 | 157.52 | 160.78 |
| SN6 | 158.75 | 156.31 | 155.45 | 154.87 | 154.38 | 154.54 | 158.03 |
| SN7 | 156.41 | 154.36 | 153.43 | 152.85 | 152.33 | 152.49 | 155.71 |
| Statistics | | | | | | | |
| Min | 156.41 | 154.36 | 153.43 | 152.85 | 152.33 | 152.49 | 155.71 |
| Max | 161.84 | 159.49 | 158.51 | 157.93 | 157.45 | 157.52 | 160.78 |
| Average | 159.54 | 157.30 | 156.21 | 155.67 | 155.26 | 155.41 | 158.92 |
| Sigma | 1.85 | 1.80 | 1.69 | 1.71 | 1.76 | 1.74 | 1.85 |
| (hfe) Lot WorstCase | 154.00 | 151.91 | 151.12 | 150.54 | 149.98 | 150.17 | 153.36 |

**Drift Calculation**

| hfe9 | 0 kRad | 26.3 kRad | 52.2 kRad | 78.1 kRad | 108.6 kRad | 24 Hours | 168 Hours |
|---|---|---|---|---|---|---|---|
| On samples | | | | | | | |
| SN2 | - | 83.66E-06 | 147.94E-06 | 165.65E-06 | 173.53E-06 | 162.85E-06 | 11.39E-06 |
| SN3 | - | 86.65E-06 | 131.86E-06 | 151.79E-06 | 167.69E-06 | 164.56E-06 | 11.68E-06 |
| SN4 | - | 90.77E-06 | 129.56E-06 | 152.83E-06 | 172.16E-06 | 169.32E-06 | 40.42E-06 |
| SN6 | - | 98.60E-06 | 133.68E-06 | 157.83E-06 | 178.37E-06 | 171.49E-06 | 28.64E-06 |
| SN7 | - | 85.11E-06 | 124.34E-06 | 148.90E-06 | 171.29E-06 | 164.44E-06 | 28.90E-06 |
| Average | - | 88.96E-06 | 133.48E-06 | 155.40E-06 | 172.61E-06 | 166.53E-06 | 24.21E-06 |
| Sigma | - | 5.37E-06 | 7.88E-06 | 5.88E-06 | 3.47E-06 | 3.29E-06 | 11.19E-06 |
| d(1/hfe) Lot WorstCase | - | 105.07E-06 | 157.11E-06 | 173.04E-06 | 183.01E-06 | 176.40E-06 | 57.77E-06 |

**Test conditions : TID**
**Parameter : Forward-Current Transfer Ratio 10 : hfe10**
**Vce = 2V Ic = 8A**
Unit :
Spec Limit Min : 1.00
Spec limits are represented in bold lines on the graphic.



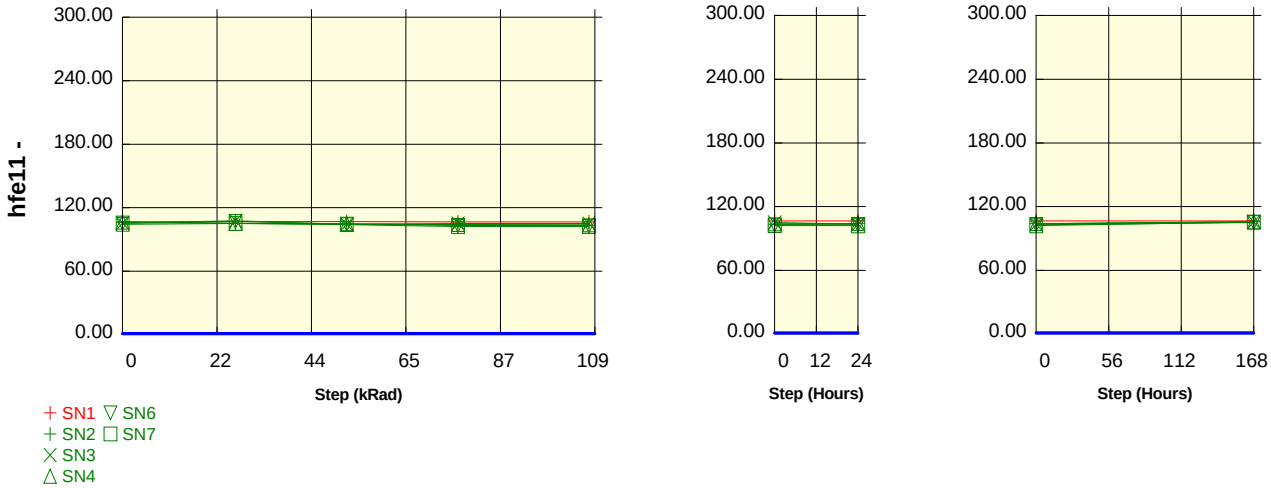

**Measurements**

| hfe10 | 0 kRad | 26.3 kRad | 52.2 kRad | 78.1 kRad | 108.6 kRad | 24 Hours | 168 Hours |
|---|---|---|---|---|---|---|---|
| SN1_REF | 129.01 | 129.09 | 129.05 | 129.12 | 129.12 | 129.11 | 129.09 |
| On samples | | | | | | | |
| SN2 | 128.45 | 127.11 | 126.21 | 125.69 | 125.30 | 125.47 | 128.30 |
| SN3 | 127.99 | 126.56 | 125.87 | 125.37 | 125.02 | 125.05 | 127.95 |
| SN4 | 129.10 | 127.44 | 126.76 | 126.26 | 125.75 | 126.00 | 128.35 |
| SN6 | 127.41 | 125.75 | 125.11 | 124.60 | 124.16 | 124.33 | 126.96 |
| SN7 | 125.80 | 124.40 | 123.73 | 123.21 | 122.78 | 122.91 | 125.34 |
| Statistics | | | | | | | |
| Min | 125.80 | 124.40 | 123.73 | 123.21 | 122.78 | 122.91 | 125.34 |
| Max | 129.10 | 127.44 | 126.76 | 126.26 | 125.75 | 126.00 | 128.35 |
| Average | 127.75 | 126.25 | 125.54 | 125.03 | 124.60 | 124.75 | 127.38 |
| Sigma | 1.12 | 1.09 | 1.05 | 1.05 | 1.05 | 1.07 | 1.14 |
| (hfe) Lot WorstCase | 124.39 | 122.98 | 122.39 | 121.86 | 121.46 | 121.54 | 123.97 |

**Drift Calculation**

| hfe10 | 0 kRad | 26.3 kRad | 52.2 kRad | 78.1 kRad | 108.6 kRad | 24 Hours | 168 Hours |
|---|---|---|---|---|---|---|---|
| On samples | | | | | | | |
| SN2 | - | 81.73E-06 | 137.87E-06 | 170.61E-06 | 195.65E-06 | 184.47E-06 | 8.87E-06 |
| SN3 | - | 88.14E-06 | 131.70E-06 | 163.40E-06 | 185.68E-06 | 183.38E-06 | 2.16E-06 |
| SN4 | - | 100.59E-06 | 142.97E-06 | 174.26E-06 | 206.11E-06 | 190.41E-06 | 45.07E-06 |
| SN6 | - | 103.86E-06 | 144.38E-06 | 176.96E-06 | 205.46E-06 | 194.37E-06 | 27.70E-06 |
| SN7 | - | 89.98E-06 | 133.26E-06 | 167.47E-06 | 195.58E-06 | 187.37E-06 | 29.62E-06 |
| Average | - | 92.86E-06 | 138.04E-06 | 170.54E-06 | 197.70E-06 | 188.00E-06 | 22.69E-06 |
| Sigma | - | 8.19E-06 | 5.05E-06 | 4.81E-06 | 7.54E-06 | 4.02E-06 | 15.40E-06 |
| d(1/hfe) Lot WorstCase | - | 117.42E-06 | 153.19E-06 | 184.96E-06 | 220.31E-06 | 200.05E-06 | 68.89E-06 |

**Test conditions : TID**
**Parameter : Forward-Current Transfer Ratio 11 : hfe11**
**Vce = 2V Ic = 10A**
Unit :
Spec Limit Min : 1.00
Spec limits are represented in bold lines on the graphic.



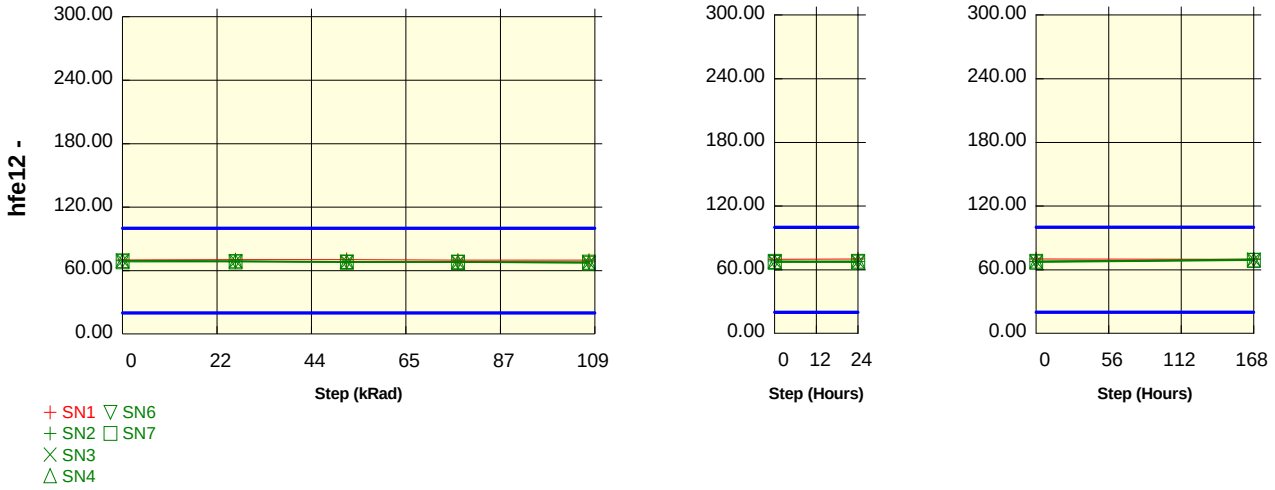

**Measurements**

| hfe11 | 0 kRad | 26.3 kRad | 52.2 kRad | 78.1 kRad | 108.6 kRad | 24 Hours | 168 Hours |
|---|---|---|---|---|---|---|---|
| SN1_REF | 106.40 | 106.67 | 106.77 | 106.54 | 106.57 | 106.55 | 106.46 |
| On samples | | | | | | | |
| SN2 | 106.00 | 105.20 | 104.57 | 103.80 | 103.53 | 103.80 | 105.78 |
| SN3 | 105.53 | 107.55 | 104.22 | 105.04 | 105.02 | 103.38 | 105.64 |
| SN4 | 106.39 | 105.09 | 104.79 | 103.97 | 103.63 | 104.00 | 105.61 |
| SN6 | 105.33 | 106.96 | 104.27 | 103.05 | 102.78 | 102.98 | 104.93 |
| SN7 | 104.11 | 104.90 | 103.92 | 102.03 | 102.06 | 102.01 | 105.53 |
| Statistics | | | | | | | |
| Min | 104.11 | 104.90 | 103.92 | 102.03 | 102.06 | 102.01 | 104.93 |
| Max | 106.39 | 107.55 | 104.79 | 105.04 | 105.02 | 104.00 | 105.78 |
| Average | 105.47 | 105.94 | 104.36 | 103.58 | 103.40 | 103.24 | 105.50 |
| Sigma | 0.77 | 1.09 | 0.30 | 1.00 | 0.99 | 0.71 | 0.29 |
| (hfe) Lot WorstCase | 103.15 | 102.66 | 103.46 | 100.57 | 100.44 | 101.11 | 104.62 |

**Drift Calculation**

| hfe11 | 0 kRad | 26.3 kRad | 52.2 kRad | 78.1 kRad | 108.6 kRad | 24 Hours | 168 Hours |
|---|---|---|---|---|---|---|---|
| On samples | | | | | | | |
| SN2 | - | 72.22E-06 | 129.56E-06 | 200.13E-06 | 225.68E-06 | 199.75E-06 | 19.34E-06 |
| SN3 | - | -177.61E-06 | 119.11E-06 | 44.34E-06 | 46.59E-06 | 197.13E-06 | -9.43E-06 |
| SN4 | - | 116.03E-06 | 143.44E-06 | 219.25E-06 | 250.54E-06 | 216.04E-06 | 69.61E-06 |
| SN6 | - | -144.59E-06 | 95.89E-06 | 209.28E-06 | 235.30E-06 | 215.98E-06 | 35.45E-06 |
| SN7 | - | -71.67E-06 | 17.72E-06 | 196.13E-06 | 193.51E-06 | 198.19E-06 | -129.01E-06 |
| Average | - | -41.12E-06 | 101.14E-06 | 173.82E-06 | 190.32E-06 | 205.42E-06 | -2.81E-06 |
| Sigma | - | 116.46E-06 | 44.51E-06 | 65.23E-06 | 74.26E-06 | 8.69E-06 | 68.07E-06 |
| d(1/hfe) Lot WorstCase | - | 308.25E-06 | 234.67E-06 | 369.53E-06 | 413.09E-06 | 231.48E-06 | 201.41E-06 |

**Test conditions : TID**
**Parameter : Forward-Current Transfer Ratio 12 : hfe12**
**Vce = 2V Ic = 15A**
Unit :
Spec Limit Min : 20.00
Spec Limit Max : 100.00
Spec limits are represented in bold lines on the graphic.



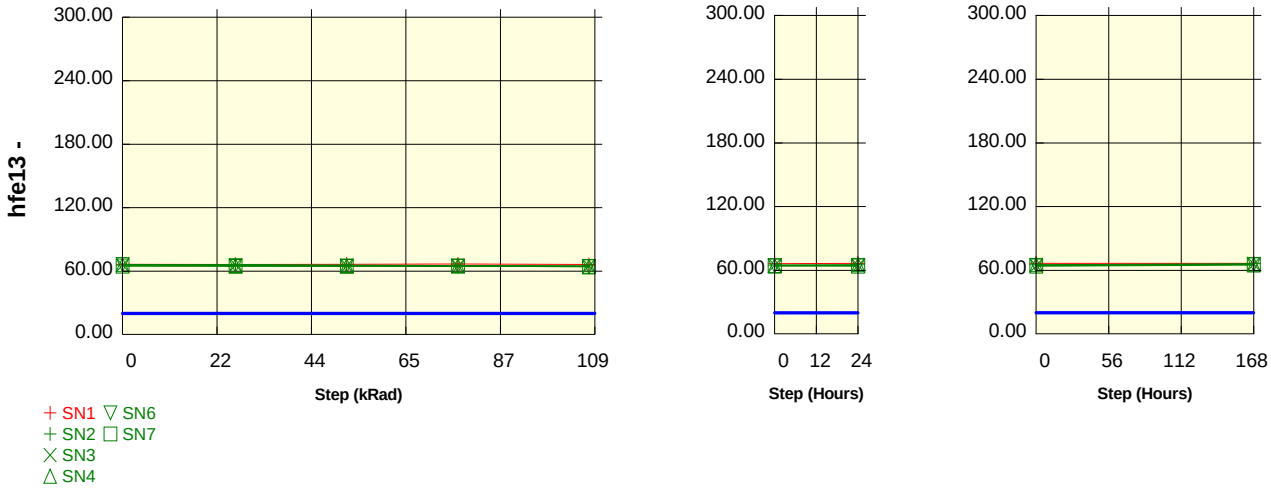

**Measurements**

| hfe12 | 0 kRad | 26.3 kRad | 52.2 kRad | 78.1 kRad | 108.6 kRad | 24 Hours | 168 Hours |
|---|---|---|---|---|---|---|---|
| SN1_REF | 70.14 | 70.33 | 70.43 | 69.86 | 69.77 | 70.00 | 69.72 |
| On samples | | | | | | | |
| SN2 | 69.44 | 68.90 | 68.12 | 68.49 | 68.18 | 67.84 | 70.00 |
| SN3 | 69.44 | 68.90 | 68.22 | 67.87 | 67.57 | 67.53 | 69.54 |
| SN4 | 69.44 | 69.03 | 68.58 | 68.27 | 67.75 | 68.18 | 69.17 |
| SN6 | 69.22 | 68.49 | 68.14 | 67.96 | 67.87 | 67.87 | 69.12 |
| SN7 | 68.36 | 68.18 | 67.78 | 67.66 | 66.96 | 67.05 | 68.81 |
| Statistics | | | | | | | |
| Min | 68.36 | 68.18 | 67.78 | 67.66 | 66.96 | 67.05 | 68.81 |
| Max | 69.44 | 69.03 | 68.58 | 68.49 | 68.18 | 68.18 | 70.00 |
| Average | 69.18 | 68.70 | 68.17 | 68.05 | 67.67 | 67.70 | 69.33 |
| Sigma | 0.42 | 0.32 | 0.26 | 0.30 | 0.40 | 0.38 | 0.41 |
| (hfe) Lot WorstCase | 67.93 | 67.75 | 67.40 | 67.16 | 66.45 | 66.55 | 68.10 |

**Drift Calculation**

| hfe12 | 0 kRad | 26.3 kRad | 52.2 kRad | 78.1 kRad | 108.6 kRad | 24 Hours | 168 Hours |
|---|---|---|---|---|---|---|---|
| On samples | | | | | | | |
| SN2 | - | 113.98E-06 | 279.43E-06 | 200.00E-06 | 266.67E-06 | 341.04E-06 | -114.28E-06 |
| SN3 | - | 113.98E-06 | 258.13E-06 | 333.33E-06 | 400.00E-06 | 407.44E-06 | -19.18E-06 |
| SN4 | - | 85.98E-06 | 180.56E-06 | 247.14E-06 | 360.64E-06 | 266.67E-06 | 57.83E-06 |
| SN6 | - | 152.60E-06 | 227.23E-06 | 266.31E-06 | 285.93E-06 | 285.93E-06 | 19.26E-06 |
| SN7 | - | 39.01E-06 | 125.34E-06 | 152.63E-06 | 305.67E-06 | 285.79E-06 | -94.33E-06 |
| Average | - | 101.11E-06 | 214.14E-06 | 239.88E-06 | 323.78E-06 | 317.37E-06 | -30.14E-06 |
| Sigma | - | 37.60E-06 | 55.46E-06 | 61.13E-06 | 49.38E-06 | 51.44E-06 | 65.57E-06 |
| d(1/hfe) Lot WorstCase | - | 213.90E-06 | 380.53E-06 | 423.29E-06 | 471.91E-06 | 471.68E-06 | 166.59E-06 |

**Test conditions : TID**
**Parameter : Forward-Current Transfer Ratio 13 : hfe13**
**Vce = 5V Ic = 20A**
Unit :
Spec Limit Min : 20.00
Spec limits are represented in bold lines on the graphic.



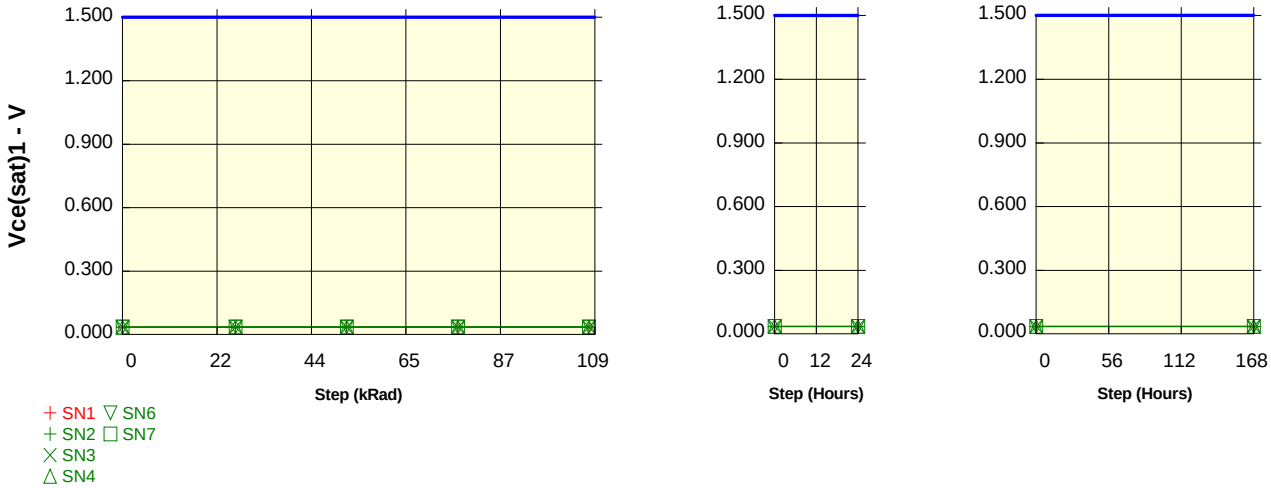

**Measurements**

| hfe13 | 0 kRad | 26.3 kRad | 52.2 kRad | 78.1 kRad | 108.6 kRad | 24 Hours | 168 Hours |
|---|---|---|---|---|---|---|---|
| SN1_REF | 66.36 | 66.23 | 66.58 | 66.67 | 66.07 | 66.51 | 66.45 |
| On samples | | | | | | | |
| SN2 | 65.62 | 66.07 | 65.79 | 65.06 | 64.94 | 65.15 | 66.23 |
| SN3 | 65.72 | 65.64 | 65.06 | 64.71 | 64.79 | 64.44 | 65.79 |
| SN4 | 65.94 | 65.23 | 65.15 | 65.15 | 64.42 | 65.15 | 65.72 |
| SN6 | 66.09 | 65.21 | 64.92 | 64.71 | 64.23 | 64.66 | 65.64 |
| SN7 | 64.71 | 64.44 | 64.44 | 64.58 | 64.03 | 63.97 | 65.02 |
| Statistics | | | | | | | |
| Min | 64.71 | 64.44 | 64.44 | 64.58 | 64.03 | 63.97 | 65.02 |
| Max | 66.09 | 66.07 | 65.79 | 65.15 | 64.94 | 65.15 | 66.23 |
| Average | 65.62 | 65.32 | 65.07 | 64.84 | 64.48 | 64.67 | 65.68 |
| Sigma | 0.48 | 0.54 | 0.44 | 0.22 | 0.34 | 0.45 | 0.39 |
| (hfe) Lot WorstCase | 64.17 | 63.69 | 63.77 | 64.18 | 63.46 | 63.34 | 64.51 |

**Drift Calculation**

| hfe13 | 0 kRad | 26.3 kRad | 52.2 kRad | 78.1 kRad | 108.6 kRad | 24 Hours | 168 Hours |
|---|---|---|---|---|---|---|---|
| On samples | | | | | | | |
| SN2 | - | -104.18E-06 | -39.04E-06 | 130.22E-06 | 160.96E-06 | 110.96E-06 | -139.04E-06 |
| SN3 | - | 19.55E-06 | 154.05E-06 | 238.42E-06 | 219.35E-06 | 303.75E-06 | -15.21E-06 |
| SN4 | - | 165.49E-06 | 184.83E-06 | 184.83E-06 | 357.22E-06 | 184.83E-06 | 50.05E-06 |
| SN6 | - | 204.40E-06 | 273.53E-06 | 323.38E-06 | 438.60E-06 | 335.20E-06 | 104.50E-06 |
| SN7 | - | 65.32E-06 | 65.32E-06 | 30.88E-06 | 165.12E-06 | 177.63E-06 | -72.88E-06 |
| Average | - | 70.12E-06 | 127.74E-06 | 181.55E-06 | 268.25E-06 | 222.47E-06 | -14.52E-06 |
| Sigma | - | 109.63E-06 | 106.69E-06 | 98.69E-06 | 110.88E-06 | 83.88E-06 | 86.31E-06 |
| d(1/hfe) Lot WorstCase | - | 399.00E-06 | 447.82E-06 | 477.61E-06 | 600.89E-06 | 474.11E-06 | 244.42E-06 |

**Test conditions : TID**
**Parameter : Collector- Emitter Saturation Voltage : Vce(sat)1**
**Ic = 1A Ib = 100mA**
Unit : V
Spec Limit Max : 1.500
Spec limits are represented in bold lines on the graphic.



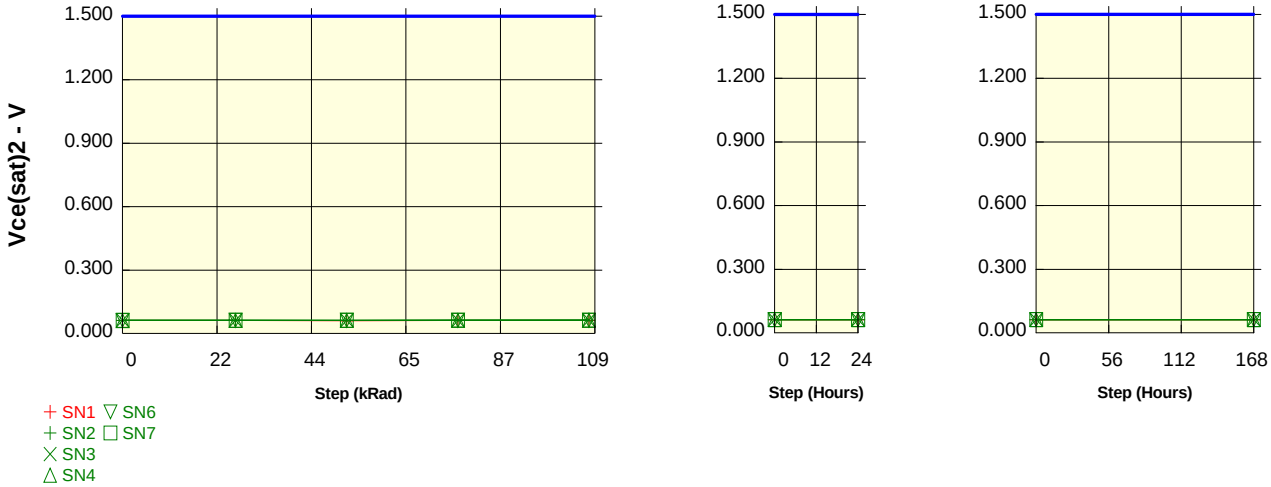

**Measurements**

| Vce(sat)1 | 0 kRad | 26.3 kRad | 52.2 kRad | 78.1 kRad | 108.6 kRad | 24 Hours | 168 Hours |
|---|---|---|---|---|---|---|---|
| SN1_REF | 0.035 | 0.034 | 0.034 | 0.035 | 0.035 | 0.034 | 0.035 |
| On samples | | | | | | | |
| SN2 | 0.035 | 0.035 | 0.035 | 0.035 | 0.036 | 0.036 | 0.036 |
| SN3 | 0.035 | 0.035 | 0.035 | 0.036 | 0.036 | 0.036 | 0.036 |
| SN4 | 0.035 | 0.035 | 0.035 | 0.035 | 0.036 | 0.035 | 0.036 |
| SN6 | 0.035 | 0.035 | 0.035 | 0.036 | 0.036 | 0.036 | 0.036 |
| SN7 | 0.035 | 0.035 | 0.036 | 0.036 | 0.036 | 0.036 | 0.036 |
| Statistics | | | | | | | |
| Min | 0.035 | 0.035 | 0.035 | 0.035 | 0.036 | 0.035 | 0.036 |
| Max | 0.035 | 0.035 | 0.036 | 0.036 | 0.036 | 0.036 | 0.036 |
| Average | 0.035 | 0.035 | 0.035 | 0.036 | 0.036 | 0.036 | 0.036 |
| Sigma | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| (Vce) Lot WorstCase | 0.036 | 0.036 | 0.036 | 0.036 | 0.036 | 0.036 | 0.036 |

**Drift Calculation**

| Vce(sat)1 | 0 kRad | 26.3 kRad | 52.2 kRad | 78.1 kRad | 108.6 kRad | 24 Hours | 168 Hours |
|---|---|---|---|---|---|---|---|
| On samples | | | | | | | |
| SN2 | - | 80.00E-06 | -240.00E-06 | 160.00E-06 | 640.00E-06 | 920.00E-06 | 880.00E-06 |
| SN3 | - | 200.00E-06 | 160.00E-06 | 520.00E-06 | 600.00E-06 | 800.00E-06 | 560.00E-06 |
| SN4 | - | 640.00E-06 | 640.00E-06 | 840.00E-06 | 1.16E-03 | 840.00E-06 | 1000.00E-06 |
| SN6 | - | 480.00E-06 | 520.00E-06 | 680.00E-06 | 880.00E-06 | 840.00E-06 | 760.00E-06 |
| SN7 | - | 200.00E-06 | 280.00E-06 | 600.00E-06 | 720.00E-06 | 720.00E-06 | 680.00E-06 |
| Average | - | 320.00E-06 | 272.00E-06 | 560.00E-06 | 800.00E-06 | 824.00E-06 | 776.00E-06 |
| Sigma | - | 207.08E-06 | 307.14E-06 | 226.27E-06 | 203.96E-06 | 64.99E-06 | 153.05E-06 |
| d(Vce) Lot WorstCase | - | 941.23E-06 | 1.19E-03 | 1.24E-03 | 1.41E-03 | 1.02E-03 | 1.24E-03 |

**Test conditions : TID**
**Parameter : Collector- Emitter Saturation Voltage : Vce(sat)2**
**Ic = 2A Ib = 200mA**
Unit : V
Spec Limit Max : 1.500
Spec limits are represented in bold lines on the graphic.



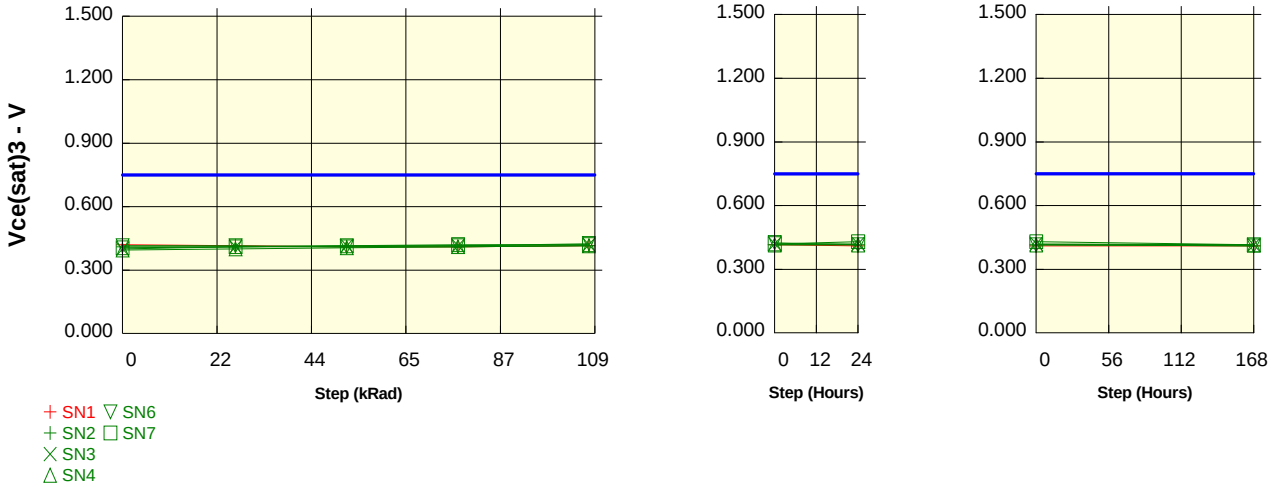

**Measurements**

| Vce(sat)2 | 0 kRad | 26.3 kRad | 52.2 kRad | 78.1 kRad | 108.6 kRad | 24 Hours | 168 Hours |
|---|---|---|---|---|---|---|---|
| SN1_REF | 0.062 | 0.061 | 0.061 | 0.061 | 0.061 | 0.061 | 0.062 |
| On samples | | | | | | | |
| SN2 | 0.062 | 0.062 | 0.061 | 0.062 | 0.062 | 0.063 | 0.063 |
| SN3 | 0.062 | 0.062 | 0.062 | 0.063 | 0.063 | 0.063 | 0.063 |
| SN4 | 0.061 | 0.062 | 0.062 | 0.062 | 0.062 | 0.062 | 0.062 |
| SN6 | 0.062 | 0.062 | 0.062 | 0.062 | 0.063 | 0.063 | 0.063 |
| SN7 | 0.063 | 0.062 | 0.063 | 0.063 | 0.063 | 0.063 | 0.063 |
| Statistics | | | | | | | |
| Min | 0.061 | 0.062 | 0.061 | 0.062 | 0.062 | 0.062 | 0.062 |
| Max | 0.063 | 0.062 | 0.063 | 0.063 | 0.063 | 0.063 | 0.063 |
| Average | 0.062 | 0.062 | 0.062 | 0.062 | 0.063 | 0.063 | 0.063 |
| Sigma | 0.000 | 0.000 | 0.001 | 0.001 | 0.000 | 0.000 | 0.000 |
| (Vce) Lot WorstCase | 0.063 | 0.063 | 0.064 | 0.064 | 0.063 | 0.064 | 0.064 |

**Drift Calculation**

| Vce(sat)2 | 0 kRad | 26.3 kRad | 52.2 kRad | 78.1 kRad | 108.6 kRad | 24 Hours | 168 Hours |
|---|---|---|---|---|---|---|---|
| On samples | | | | | | | |
| SN2 | - | -120.00E-06 | -760.00E-06 | -200.00E-06 | 640.00E-06 | 960.00E-06 | 1000.00E-06 |
| SN3 | - | 0.00E+00 | -200.00E-06 | 200.00E-06 | 400.00E-06 | 720.00E-06 | 360.00E-06 |
| SN4 | - | 680.00E-06 | 600.00E-06 | 680.00E-06 | 1000.00E-06 | 720.00E-06 | 920.00E-06 |
| SN6 | - | 280.00E-06 | 320.00E-06 | 520.00E-06 | 680.00E-06 | 640.00E-06 | 680.00E-06 |
| SN7 | - | -200.00E-06 | 0.00E+00 | 440.00E-06 | 440.00E-06 | 600.00E-06 | 520.01E-06 |
| Average | - | 128.00E-06 | -8.00E-06 | 328.00E-06 | 632.00E-06 | 728.00E-06 | 696.00E-06 |
| Sigma | - | 320.40E-06 | 464.69E-06 | 306.10E-06 | 213.77E-06 | 124.96E-06 | 239.46E-06 |
| d(Vce) Lot WorstCase | - | 1.09E-03 | 1.39E-03 | 1.25E-03 | 1.27E-03 | 1.10E-03 | 1.41E-03 |

**Test conditions : TID**
**Parameter : Collector- Emitter Saturation Voltage : Vce(sat)3**
**Ic = 15A Ib = 1.2A**
Unit : V
Spec Limit Max : 0.750
Spec limits are represented in bold lines on the graphic.



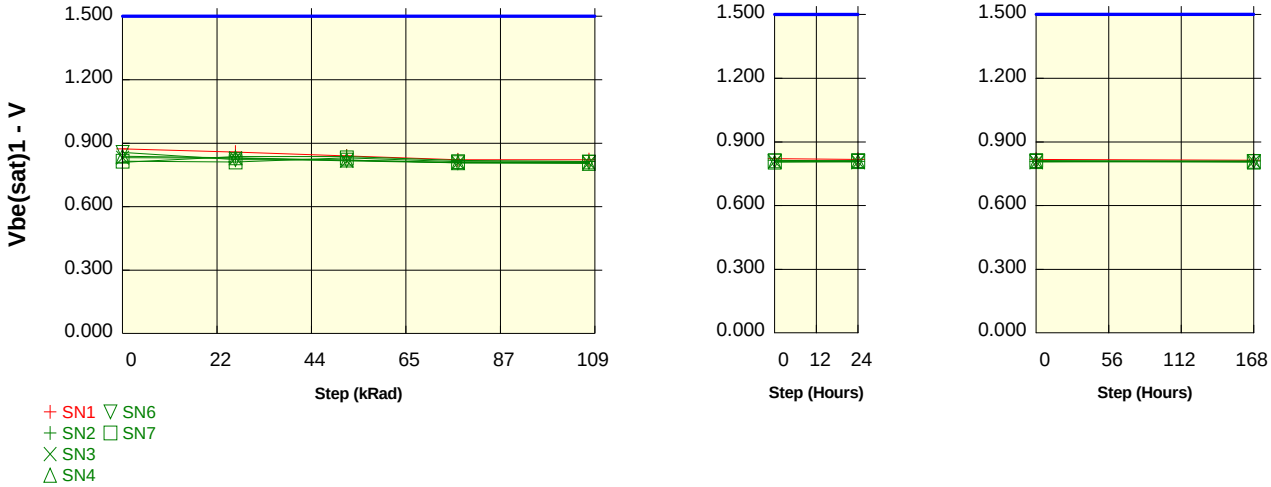

**Measurements**

| Vce(sat)3 | 0 kRad | 26.3 kRad | 52.2 kRad | 78.1 kRad | 108.6 kRad | 24 Hours | 168 Hours |
|---|---|---|---|---|---|---|---|
| SN1_REF | 0.420 | 0.415 | 0.410 | 0.410 | 0.415 | 0.410 | 0.410 |
| On samples | | | | | | | |
| SN2 | 0.410 | 0.410 | 0.410 | 0.410 | 0.415 | 0.415 | 0.410 |
| SN3 | 0.400 | 0.410 | 0.415 | 0.415 | 0.420 | 0.420 | 0.415 |
| SN4 | 0.395 | 0.400 | 0.405 | 0.410 | 0.415 | 0.415 | 0.415 |
| SN6 | 0.415 | 0.415 | 0.410 | 0.415 | 0.425 | 0.415 | 0.410 |
| SN7 | 0.405 | 0.410 | 0.415 | 0.420 | 0.420 | 0.430 | 0.415 |
| Statistics | | | | | | | |
| Min | 0.395 | 0.400 | 0.405 | 0.410 | 0.415 | 0.415 | 0.410 |
| Max | 0.415 | 0.415 | 0.415 | 0.420 | 0.425 | 0.430 | 0.415 |
| Average | 0.405 | 0.409 | 0.411 | 0.414 | 0.419 | 0.419 | 0.413 |
| Sigma | 0.007 | 0.005 | 0.004 | 0.004 | 0.004 | 0.006 | 0.002 |
| (Vce) Lot WorstCase | 0.426 | 0.424 | 0.422 | 0.425 | 0.430 | 0.436 | 0.420 |

**Drift Calculation**

| Vce(sat)3 | 0 kRad | 26.3 kRad | 52.2 kRad | 78.1 kRad | 108.6 kRad | 24 Hours | 168 Hours |
|---|---|---|---|---|---|---|---|
| On samples | | | | | | | |
| SN2 | - | 0.00E+00 | 0.00E+00 | 0.00E+00 | 5.00E-03 | 5.00E-03 | 0.00E+00 |
| SN3 | - | 10.00E-03 | 15.00E-03 | 15.00E-03 | 20.00E-03 | 20.00E-03 | 15.00E-03 |
| SN4 | - | 5.00E-03 | 10.00E-03 | 15.00E-03 | 20.00E-03 | 20.00E-03 | 20.00E-03 |
| SN6 | - | 0.00E+00 | -5.00E-03 | 0.00E+00 | 10.00E-03 | 0.00E+00 | -5.00E-03 |
| SN7 | - | 5.00E-03 | 10.00E-03 | 15.00E-03 | 15.00E-03 | 25.00E-03 | 10.00E-03 |
| Average | - | 4.00E-03 | 6.00E-03 | 9.00E-03 | 14.00E-03 | 14.00E-03 | 8.00E-03 |
| Sigma | - | 3.74E-03 | 7.35E-03 | 7.35E-03 | 5.83E-03 | 9.70E-03 | 9.27E-03 |
| d(Vce) Lot WorstCase | - | 15.22E-03 | 28.05E-03 | 31.05E-03 | 31.49E-03 | 43.09E-03 | 35.82E-03 |

**Test conditions : TID**
**Parameter : Base- Emitter Saturation Voltage : Vbe(sat)1**
**Ic = 1A Ib = 100mA**
Unit : V
Spec Limit Max : 1.500
Spec limits are represented in bold lines on the graphic.



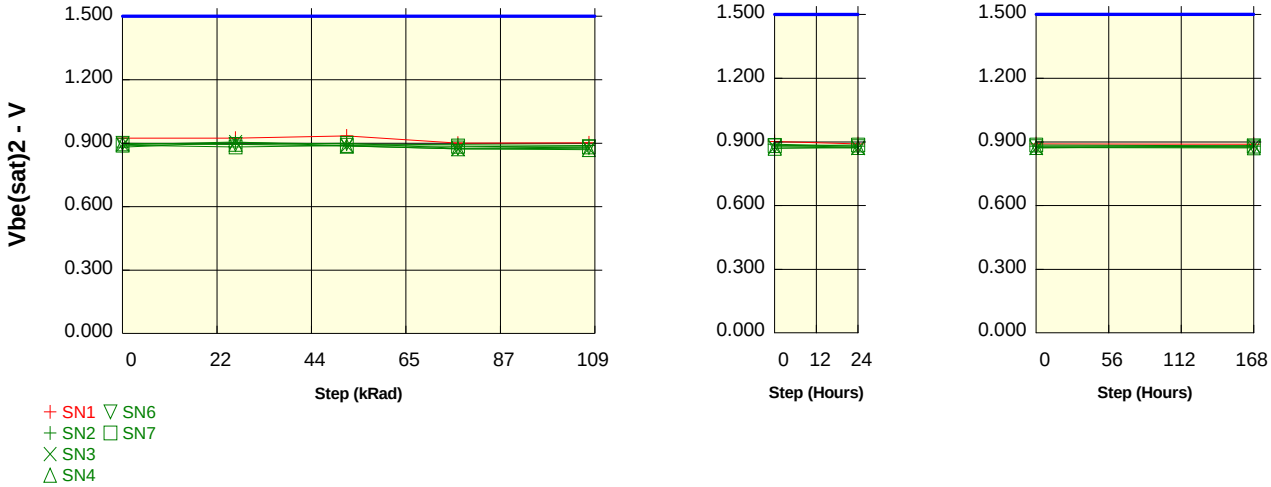

**Measurements**

| Vbe(sat)1 | 0 kRad | 26.3 kRad | 52.2 kRad | 78.1 kRad | 108.6 kRad | 24 Hours | 168 Hours |
|---|---|---|---|---|---|---|---|
| SN1_REF | 0.873 | 0.857 | 0.839 | 0.821 | 0.822 | 0.817 | 0.814 |
| On samples | | | | | | | |
| SN2 | 0.809 | 0.837 | 0.837 | 0.819 | 0.814 | 0.808 | 0.809 |
| SN3 | 0.832 | 0.829 | 0.816 | 0.807 | 0.807 | 0.805 | 0.808 |
| SN4 | 0.838 | 0.831 | 0.820 | 0.807 | 0.804 | 0.808 | 0.804 |
| SN6 | 0.856 | 0.823 | 0.820 | 0.809 | 0.810 | 0.808 | 0.807 |
| SN7 | 0.815 | 0.812 | 0.830 | 0.812 | 0.811 | 0.813 | 0.808 |
| Statistics | | | | | | | |
| Min | 0.809 | 0.812 | 0.816 | 0.807 | 0.804 | 0.805 | 0.804 |
| Max | 0.856 | 0.837 | 0.837 | 0.819 | 0.814 | 0.813 | 0.809 |
| Average | 0.830 | 0.826 | 0.825 | 0.811 | 0.809 | 0.808 | 0.807 |
| Sigma | 0.017 | 0.009 | 0.008 | 0.004 | 0.003 | 0.002 | 0.002 |
| (Vbe) Lot WorstCase | 0.881 | 0.852 | 0.848 | 0.824 | 0.819 | 0.815 | 0.813 |

**Drift Calculation**

| Vbe(sat)1 | 0 kRad | 26.3 kRad | 52.2 kRad | 78.1 kRad | 108.6 kRad | 24 Hours | 168 Hours |
|---|---|---|---|---|---|---|---|
| On samples | | | | | | | |
| SN2 | - | 27.68E-03 | 28.20E-03 | 9.68E-03 | 4.48E-03 | -1.28E-03 | 40.00E-06 |
| SN3 | - | -2.52E-03 | -15.92E-03 | -24.56E-03 | -24.92E-03 | -26.64E-03 | -23.44E-03 |
| SN4 | - | -7.64E-03 | -18.12E-03 | -31.28E-03 | -34.24E-03 | -30.64E-03 | -34.12E-03 |
| SN6 | - | -33.68E-03 | -36.56E-03 | -47.68E-03 | -46.24E-03 | -47.88E-03 | -49.52E-03 |
| SN7 | - | -3.36E-03 | 15.12E-03 | -2.76E-03 | -3.68E-03 | -2.44E-03 | -6.64E-03 |
| Average | - | -3.90E-03 | -5.46E-03 | -19.32E-03 | -20.92E-03 | -21.78E-03 | -22.74E-03 |
| Sigma | - | 19.50E-03 | 23.64E-03 | 20.45E-03 | 18.85E-03 | 17.76E-03 | 18.03E-03 |
| d(Vbe) Lot WorstCase | - | 54.58E-03 | 65.45E-03 | 42.02E-03 | 35.63E-03 | 31.51E-03 | 31.35E-03 |

**Test conditions : TID**
**Parameter : Base- Emitter Saturation Voltage : Vbe(sat)2**
**Ic = 2A Ib = 200mA**
Unit : V
Spec Limit Max : 1.500
Spec limits are represented in bold lines on the graphic.



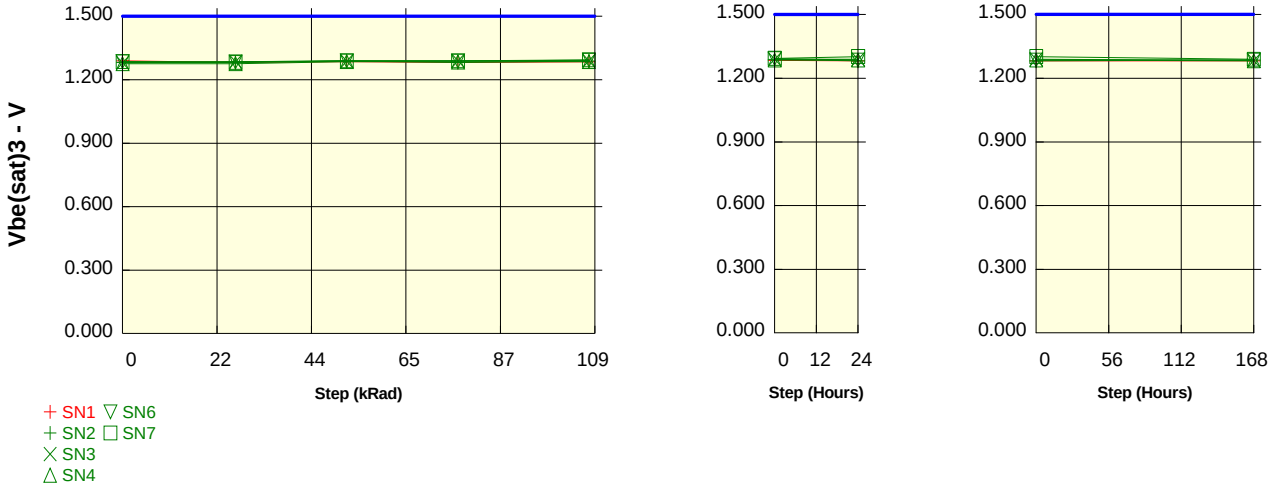

**Measurements**

| Vbe(sat)2 | 0 kRad | 26.3 kRad | 52.2 kRad | 78.1 kRad | 108.6 kRad | 24 Hours | 168 Hours |
|---|---|---|---|---|---|---|---|
| SN1_REF | 0.924 | 0.924 | 0.934 | 0.900 | 0.902 | 0.891 | 0.889 |
| On samples | | | | | | | |
| SN2 | 0.881 | 0.903 | 0.896 | 0.893 | 0.889 | 0.880 | 0.880 |
| SN3 | 0.894 | 0.905 | 0.888 | 0.873 | 0.875 | 0.872 | 0.881 |
| SN4 | 0.897 | 0.894 | 0.886 | 0.874 | 0.870 | 0.873 | 0.872 |
| SN6 | 0.899 | 0.894 | 0.899 | 0.876 | 0.881 | 0.877 | 0.875 |
| SN7 | 0.891 | 0.882 | 0.890 | 0.886 | 0.883 | 0.885 | 0.881 |
| Statistics | | | | | | | |
| Min | 0.881 | 0.882 | 0.886 | 0.873 | 0.870 | 0.872 | 0.872 |
| Max | 0.899 | 0.905 | 0.899 | 0.893 | 0.889 | 0.885 | 0.881 |
| Average | 0.892 | 0.896 | 0.892 | 0.880 | 0.880 | 0.877 | 0.878 |
| Sigma | 0.006 | 0.008 | 0.005 | 0.008 | 0.006 | 0.005 | 0.004 |
| (Vbe) Lot WorstCase | 0.911 | 0.920 | 0.907 | 0.904 | 0.899 | 0.892 | 0.889 |

**Drift Calculation**

| Vbe(sat)2 | 0 kRad | 26.3 kRad | 52.2 kRad | 78.1 kRad | 108.6 kRad | 24 Hours | 168 Hours |
|---|---|---|---|---|---|---|---|
| On samples | | | | | | | |
| SN2 | - | 21.80E-03 | 14.28E-03 | 11.44E-03 | 7.08E-03 | -1.56E-03 | -1.16E-03 |
| SN3 | - | 11.80E-03 | -5.84E-03 | -20.76E-03 | -18.16E-03 | -21.60E-03 | -12.64E-03 |
| SN4 | - | -3.60E-03 | -11.56E-03 | -23.88E-03 | -27.40E-03 | -24.04E-03 | -25.36E-03 |
| SN6 | - | -4.84E-03 | 240.01E-06 | -22.40E-03 | -18.24E-03 | -22.32E-03 | -23.76E-03 |
| SN7 | - | -8.52E-03 | -1.12E-03 | -5.24E-03 | -7.84E-03 | -5.56E-03 | -10.04E-03 |
| Average | - | 3.33E-03 | -799.98E-06 | -12.17E-03 | -12.91E-03 | -15.02E-03 | -14.59E-03 |
| Sigma | - | 11.56E-03 | 8.60E-03 | 13.57E-03 | 11.76E-03 | 9.47E-03 | 9.00E-03 |
| d(Vbe) Lot WorstCase | - | 38.01E-03 | 25.00E-03 | 28.55E-03 | 22.36E-03 | 13.40E-03 | 12.41E-03 |

**Test conditions : TID**
**Parameter : Base- Emitter Saturation Voltage : Vbe(sat)3**
**Ic = 15A Ib = 1.2A**
Unit : V
Spec Limit Max : 1.500
Spec limits are represented in bold lines on the graphic.



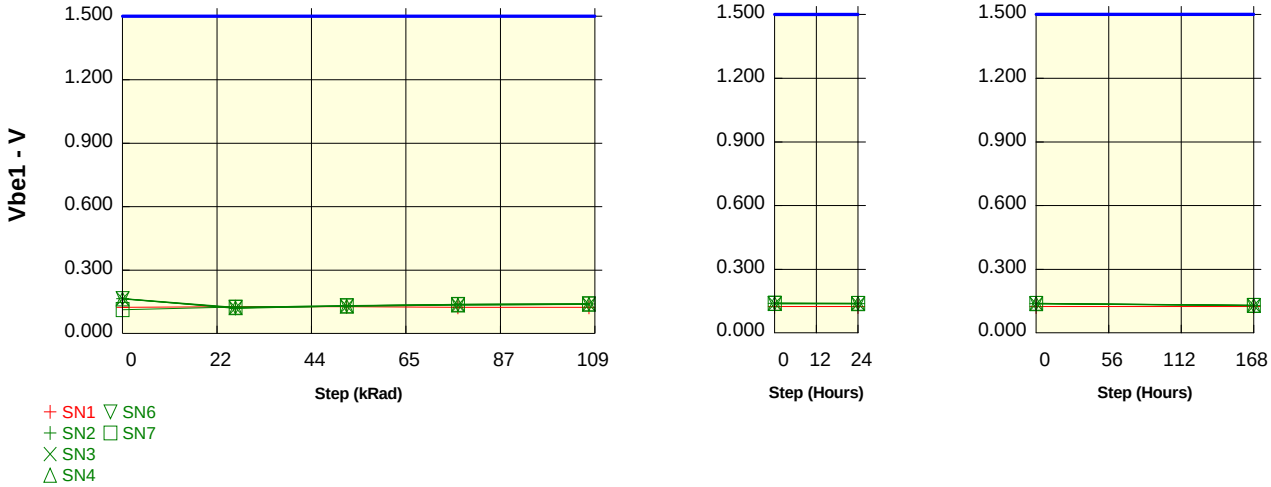

**Measurements**

| Vbe(sat)3 | 0 kRad | 26.3 kRad | 52.2 kRad | 78.1 kRad | 108.6 kRad | 24 Hours | 168 Hours |
|---|---|---|---|---|---|---|---|
| SN1_REF | 1.290 | 1.282 | 1.286 | 1.282 | 1.284 | 1.282 | 1.282 |
| On samples | | | | | | | |
| SN2 | 1.282 | 1.282 | 1.288 | 1.282 | 1.288 | 1.282 | 1.286 |
| SN3 | 1.280 | 1.286 | 1.288 | 1.290 | 1.290 | 1.290 | 1.284 |
| SN4 | 1.276 | 1.276 | 1.286 | 1.284 | 1.286 | 1.286 | 1.282 |
| SN6 | 1.286 | 1.284 | 1.290 | 1.288 | 1.292 | 1.286 | 1.286 |
| SN7 | 1.286 | 1.282 | 1.290 | 1.290 | 1.294 | 1.302 | 1.290 |
| Statistics | | | | | | | |
| Min | 1.276 | 1.276 | 1.286 | 1.282 | 1.286 | 1.282 | 1.282 |
| Max | 1.286 | 1.286 | 1.290 | 1.290 | 1.294 | 1.302 | 1.290 |
| Average | 1.282 | 1.282 | 1.288 | 1.287 | 1.290 | 1.289 | 1.286 |
| Sigma | 0.004 | 0.003 | 0.001 | 0.003 | 0.003 | 0.007 | 0.003 |
| (Vbe) Lot WorstCase | 1.293 | 1.292 | 1.293 | 1.297 | 1.298 | 1.310 | 1.294 |

**Drift Calculation**

| Vbe(sat)3 | 0 kRad | 26.3 kRad | 52.2 kRad | 78.1 kRad | 108.6 kRad | 24 Hours | 168 Hours |
|---|---|---|---|---|---|---|---|
| On samples | | | | | | | |
| SN2 | - | 26.23E-09 | 6.00E-03 | 0.00E+00 | 6.00E-03 | 0.00E+00 | 4.00E-03 |
| SN3 | - | 6.00E-03 | 8.00E-03 | 10.00E-03 | 10.00E-03 | 10.00E-03 | 4.00E-03 |
| SN4 | - | -33.38E-09 | 10.00E-03 | 8.00E-03 | 10.00E-03 | 10.00E-03 | 6.00E-03 |
| SN6 | - | -2.00E-03 | 4.00E-03 | 2.00E-03 | 6.00E-03 | 0.00E+00 | 0.00E+00 |
| SN7 | - | -4.00E-03 | 4.00E-03 | 4.00E-03 | 8.00E-03 | 16.00E-03 | 4.00E-03 |
| Average | - | -2.86E-09 | 6.40E-03 | 4.80E-03 | 8.00E-03 | 7.20E-03 | 3.60E-03 |
| Sigma | - | 3.35E-03 | 2.33E-03 | 3.71E-03 | 1.79E-03 | 6.27E-03 | 1.96E-03 |
| d(Vbe) Lot WorstCase | - | 10.04E-03 | 13.40E-03 | 15.93E-03 | 13.37E-03 | 26.02E-03 | 9.48E-03 |

**Test conditions : TID**
**Parameter : Base – Emitter Voltage : Vbe1**
**IC = 0.1 mA Vce = 2 V**
Unit : V
Spec Limit Max : 1.500
Spec limits are represented in bold lines on the graphic.



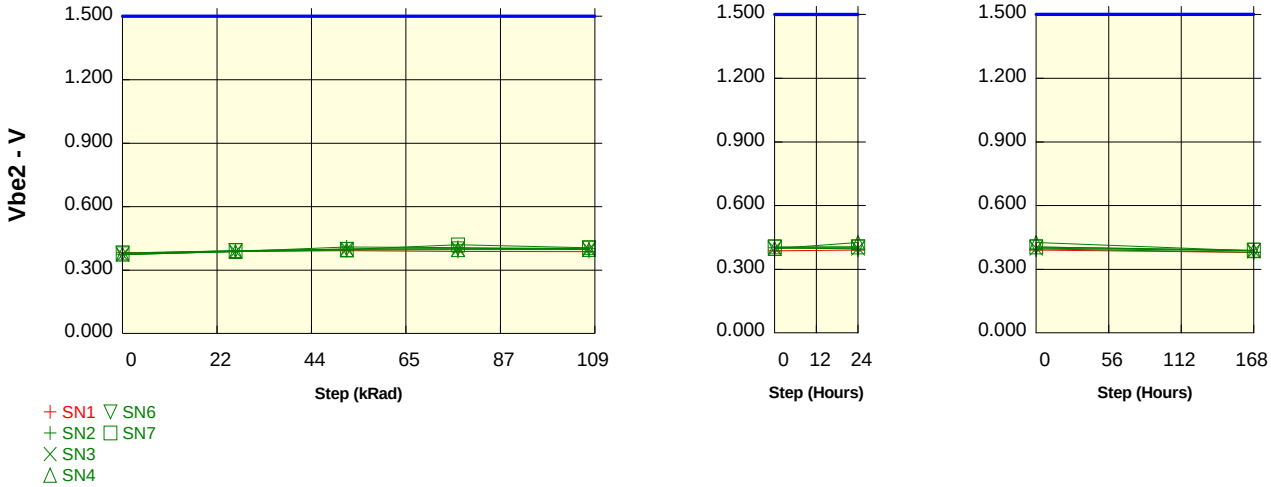

**Measurements**

| Vbe1 | 0 kRad | 26.3 kRad | 52.2 kRad | 78.1 kRad | 108.6 kRad | 24 Hours | 168 Hours |
|---|---|---|---|---|---|---|---|
| SN1_REF | 0.124 | 0.126 | 0.126 | 0.124 | 0.124 | 0.124 | 0.124 |
| On samples | | | | | | | |
| SN2 | 0.164 | 0.120 | 0.131 | 0.137 | 0.139 | 0.138 | 0.129 |
| SN3 | 0.164 | 0.122 | 0.129 | 0.134 | 0.138 | 0.137 | 0.128 |
| SN4 | 0.163 | 0.122 | 0.129 | 0.135 | 0.138 | 0.138 | 0.130 |
| SN6 | 0.166 | 0.124 | 0.132 | 0.137 | 0.139 | 0.140 | 0.129 |
| SN7 | 0.113 | 0.125 | 0.131 | 0.138 | 0.141 | 0.139 | 0.131 |
| Statistics | | | | | | | |
| Min | 0.113 | 0.120 | 0.129 | 0.134 | 0.138 | 0.137 | 0.128 |
| Max | 0.166 | 0.125 | 0.132 | 0.138 | 0.141 | 0.140 | 0.131 |
| Average | 0.154 | 0.122 | 0.130 | 0.136 | 0.139 | 0.138 | 0.130 |
| Sigma | 0.021 | 0.002 | 0.001 | 0.001 | 0.001 | 0.001 | 0.001 |
| (Vbe) Lot WorstCase | 0.216 | 0.128 | 0.133 | 0.140 | 0.142 | 0.142 | 0.132 |

**Drift Calculation**

| Vbe1 | 0 kRad | 26.3 kRad | 52.2 kRad | 78.1 kRad | 108.6 kRad | 24 Hours | 168 Hours |
|---|---|---|---|---|---|---|---|
| On samples | | | | | | | |
| SN2 | - | -44.72E-03 | -33.48E-03 | -27.64E-03 | -24.84E-03 | -26.00E-03 | -34.88E-03 |
| SN3 | - | -42.04E-03 | -34.64E-03 | -29.44E-03 | -26.08E-03 | -26.84E-03 | -35.44E-03 |
| SN4 | - | -41.40E-03 | -34.16E-03 | -28.32E-03 | -25.08E-03 | -25.38E-03 | -32.96E-03 |
| SN6 | - | -41.72E-03 | -34.44E-03 | -28.84E-03 | -26.68E-03 | -26.16E-03 | -37.24E-03 |
| SN7 | - | 11.96E-03 | 17.80E-03 | 25.03E-03 | 27.80E-03 | 26.56E-03 | 17.84E-03 |
| Average | - | -31.58E-03 | -23.78E-03 | -17.84E-03 | -14.98E-03 | -15.56E-03 | -24.54E-03 |
| Sigma | - | 21.80E-03 | 20.80E-03 | 21.45E-03 | 21.40E-03 | 21.07E-03 | 21.23E-03 |
| d(Vbe) Lot WorstCase | - | 33.83E-03 | 38.60E-03 | 46.50E-03 | 49.22E-03 | 47.64E-03 | 39.16E-03 |

**Test conditions : TID**
**Parameter : Base – Emitter Voltage : Vbe2**
**IC = 1 mA Vce = 2 V**
Unit : V
Spec Limit Max : 1.500
Spec limits are represented in bold lines on the graphic.



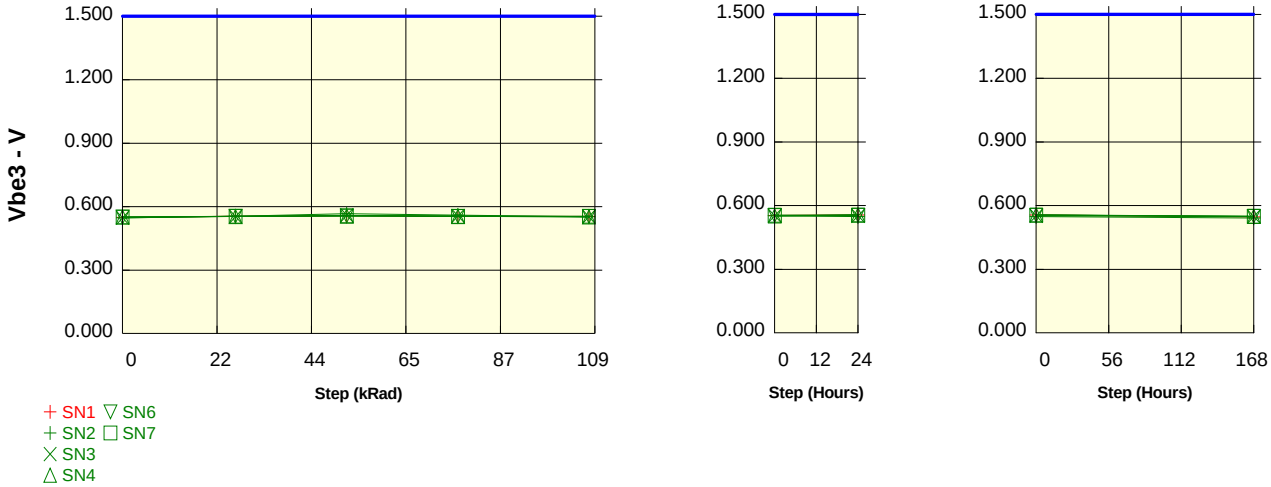

**Measurements**

| Vbe2 | 0 kRad | 26.3 kRad | 52.2 kRad | 78.1 kRad | 108.6 kRad | 24 Hours | 168 Hours |
|---|---|---|---|---|---|---|---|
| SN1_REF | 0.382 | 0.388 | 0.393 | 0.388 | 0.387 | 0.391 | 0.379 |
| On samples | | | | | | | |
| SN2 | 0.373 | 0.389 | 0.410 | 0.407 | 0.401 | 0.396 | 0.380 |
| SN3 | 0.373 | 0.388 | 0.400 | 0.400 | 0.399 | 0.399 | 0.387 |
| SN4 | 0.376 | 0.387 | 0.395 | 0.397 | 0.397 | 0.425 | 0.387 |
| SN6 | 0.378 | 0.392 | 0.398 | 0.401 | 0.403 | 0.406 | 0.389 |
| SN7 | 0.381 | 0.392 | 0.397 | 0.419 | 0.406 | 0.405 | 0.390 |
| Statistics | | | | | | | |
| Min | 0.373 | 0.387 | 0.395 | 0.397 | 0.397 | 0.396 | 0.380 |
| Max | 0.381 | 0.392 | 0.410 | 0.419 | 0.406 | 0.425 | 0.390 |
| Average | 0.376 | 0.390 | 0.400 | 0.405 | 0.401 | 0.406 | 0.387 |
| Sigma | 0.003 | 0.002 | 0.005 | 0.008 | 0.003 | 0.010 | 0.003 |
| (Vbe) Lot WorstCase | 0.386 | 0.396 | 0.415 | 0.428 | 0.410 | 0.437 | 0.397 |

**Drift Calculation**

| Vbe2 | 0 kRad | 26.3 kRad | 52.2 kRad | 78.1 kRad | 108.6 kRad | 24 Hours | 168 Hours |
|---|---|---|---|---|---|---|---|
| On samples | | | | | | | |
| SN2 | - | 16.08E-03 | 37.04E-03 | 34.36E-03 | 28.20E-03 | 23.28E-03 | 7.48E-03 |
| SN3 | - | 15.00E-03 | 27.08E-03 | 26.60E-03 | 25.88E-03 | 26.32E-03 | 13.44E-03 |
| SN4 | - | 11.32E-03 | 19.28E-03 | 20.88E-03 | 21.52E-03 | 49.56E-03 | 11.68E-03 |
| SN6 | - | 14.24E-03 | 20.24E-03 | 22.92E-03 | 25.12E-03 | 27.52E-03 | 10.48E-03 |
| SN7 | - | 11.52E-03 | 16.36E-03 | 37.88E-03 | 24.80E-03 | 23.84E-03 | 9.16E-03 |
| Average | - | 13.63E-03 | 24.00E-03 | 28.53E-03 | 25.10E-03 | 30.10E-03 | 10.45E-03 |
| Sigma | - | 1.90E-03 | 7.41E-03 | 6.56E-03 | 2.15E-03 | 9.85E-03 | 2.05E-03 |
| d(Vbe) Lot WorstCase | - | 19.33E-03 | 46.22E-03 | 48.21E-03 | 31.56E-03 | 59.66E-03 | 16.59E-03 |

**Test conditions : TID**
**Parameter : Base – Emitter Voltage : Vbe3**
**IC = 10 mA Vce = 2 V**
Unit : V
Spec Limit Max : 1.500
Spec limits are represented in bold lines on the graphic.



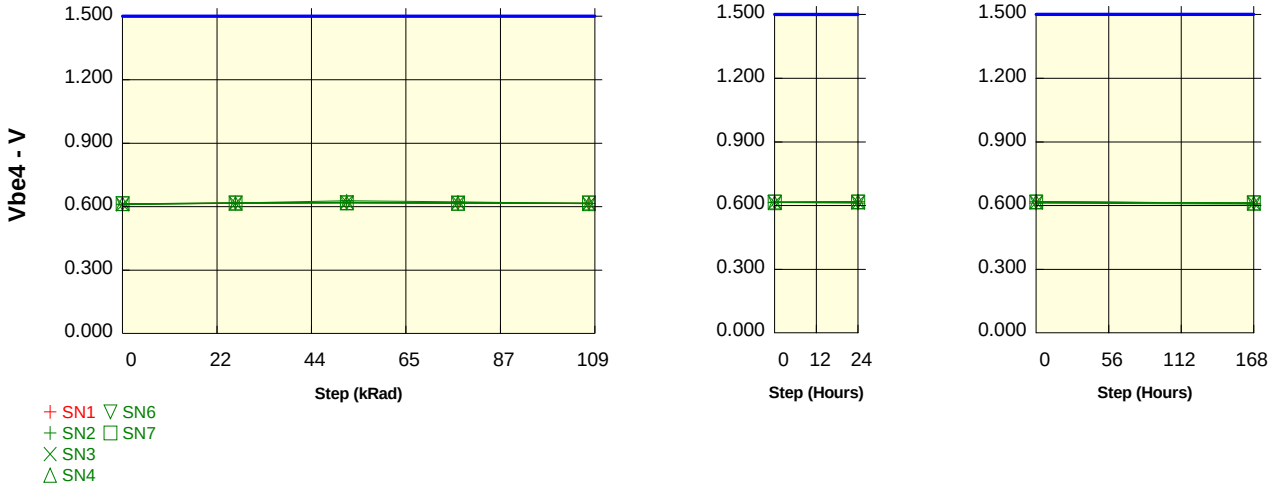

**Measurements**

| Vbe3 | 0 kRad | 26.3 kRad | 52.2 kRad | 78.1 kRad | 108.6 kRad | 24 Hours | 168 Hours |
|---|---|---|---|---|---|---|---|
| SN1_REF | 0.549 | 0.554 | 0.558 | 0.554 | 0.553 | 0.556 | 0.548 |
| On samples | | | | | | | |
| SN2 | 0.546 | 0.555 | 0.566 | 0.560 | 0.552 | 0.548 | 0.542 |
| SN3 | 0.547 | 0.553 | 0.559 | 0.556 | 0.552 | 0.552 | 0.548 |
| SN4 | 0.552 | 0.553 | 0.556 | 0.554 | 0.551 | 0.557 | 0.549 |
| SN6 | 0.550 | 0.555 | 0.556 | 0.555 | 0.554 | 0.555 | 0.550 |
| SN7 | 0.551 | 0.555 | 0.555 | 0.553 | 0.555 | 0.555 | 0.549 |
| Statistics | | | | | | | |
| Min | 0.546 | 0.553 | 0.555 | 0.553 | 0.551 | 0.548 | 0.542 |
| Max | 0.552 | 0.555 | 0.566 | 0.560 | 0.555 | 0.557 | 0.550 |
| Average | 0.549 | 0.554 | 0.558 | 0.556 | 0.553 | 0.553 | 0.548 |
| Sigma | 0.002 | 0.001 | 0.004 | 0.003 | 0.001 | 0.003 | 0.003 |
| (Vbe) Lot WorstCase | 0.555 | 0.557 | 0.571 | 0.563 | 0.557 | 0.562 | 0.556 |

**Drift Calculation**

| Vbe3 | 0 kRad | 26.3 kRad | 52.2 kRad | 78.1 kRad | 108.6 kRad | 24 Hours | 168 Hours |
|---|---|---|---|---|---|---|---|
| On samples | | | | | | | |
| SN2 | - | 8.08E-03 | 19.72E-03 | 13.92E-03 | 5.84E-03 | 2.04E-03 | -4.28E-03 |
| SN3 | - | 5.56E-03 | 11.76E-03 | 8.80E-03 | 4.76E-03 | 4.88E-03 | 1.12E-03 |
| SN4 | - | 1.28E-03 | 4.40E-03 | 2.76E-03 | -239.97E-06 | 5.32E-03 | -2.76E-03 |
| SN6 | - | 4.80E-03 | 5.96E-03 | 5.04E-03 | 3.76E-03 | 5.00E-03 | -480.00E-06 |
| SN7 | - | 3.96E-03 | 4.68E-03 | 2.20E-03 | 4.00E-03 | 4.00E-03 | -1.28E-03 |
| Average | - | 4.74E-03 | 9.30E-03 | 6.54E-03 | 3.62E-03 | 4.25E-03 | -1.54E-03 |
| Sigma | - | 2.21E-03 | 5.85E-03 | 4.36E-03 | 2.06E-03 | 1.19E-03 | 1.86E-03 |
| d(Vbe) Lot WorstCase | - | 11.36E-03 | 26.86E-03 | 19.62E-03 | 9.81E-03 | 7.81E-03 | 4.04E-03 |

**Test conditions : TID**
**Parameter : Base – Emitter Voltage : Vbe4**
**IC = 0.1 A Vce = 2 V**
Unit : V
Spec Limit Max : 1.500
Spec limits are represented in bold lines on the graphic.



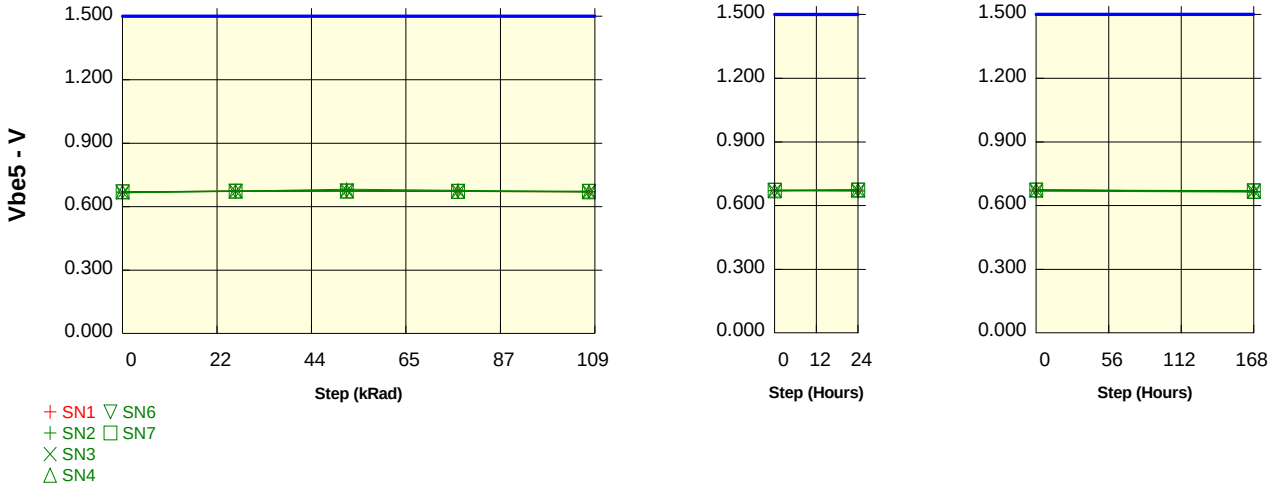

**Measurements**

| Vbe4 | 0 kRad | 26.3 kRad | 52.2 kRad | 78.1 kRad | 108.6 kRad | 24 Hours | 168 Hours |
|---|---|---|---|---|---|---|---|
| SN1_REF | 0.612 | 0.617 | 0.620 | 0.617 | 0.615 | 0.618 | 0.611 |
| On samples | | | | | | | |
| SN2 | 0.610 | 0.617 | 0.627 | 0.622 | 0.615 | 0.612 | 0.606 |
| SN3 | 0.610 | 0.616 | 0.621 | 0.618 | 0.615 | 0.615 | 0.611 |
| SN4 | 0.614 | 0.616 | 0.618 | 0.617 | 0.614 | 0.619 | 0.612 |
| SN6 | 0.613 | 0.617 | 0.618 | 0.617 | 0.616 | 0.617 | 0.613 |
| SN7 | 0.614 | 0.617 | 0.618 | 0.616 | 0.617 | 0.617 | 0.612 |
| Statistics | | | | | | | |
| Min | 0.610 | 0.616 | 0.618 | 0.616 | 0.614 | 0.612 | 0.606 |
| Max | 0.614 | 0.617 | 0.627 | 0.622 | 0.617 | 0.619 | 0.613 |
| Average | 0.612 | 0.617 | 0.621 | 0.618 | 0.615 | 0.616 | 0.611 |
| Sigma | 0.002 | 0.001 | 0.004 | 0.002 | 0.001 | 0.003 | 0.002 |
| (Vbe) Lot WorstCase | 0.618 | 0.619 | 0.631 | 0.625 | 0.619 | 0.624 | 0.618 |

**Drift Calculation**

| Vbe4 | 0 kRad | 26.3 kRad | 52.2 kRad | 78.1 kRad | 108.6 kRad | 24 Hours | 168 Hours |
|---|---|---|---|---|---|---|---|
| On samples | | | | | | | |
| SN2 | - | 7.40E-03 | 17.68E-03 | 12.48E-03 | 5.36E-03 | 2.16E-03 | -3.40E-03 |
| SN3 | - | 5.16E-03 | 10.60E-03 | 7.84E-03 | 4.20E-03 | 4.76E-03 | 920.00E-06 |
| SN4 | - | 1.28E-03 | 4.00E-03 | 2.32E-03 | -399.95E-06 | 4.68E-03 | -2.76E-03 |
| SN6 | - | 4.12E-03 | 5.24E-03 | 4.28E-03 | 3.32E-03 | 4.32E-03 | -400.01E-06 |
| SN7 | - | 3.52E-03 | 4.24E-03 | 2.00E-03 | 3.56E-03 | 3.60E-03 | -1.28E-03 |
| Average | - | 4.30E-03 | 8.35E-03 | 5.78E-03 | 3.21E-03 | 3.90E-03 | -1.38E-03 |
| Sigma | - | 2.01E-03 | 5.25E-03 | 3.94E-03 | 1.94E-03 | 963.52E-06 | 1.56E-03 |
| d(Vbe) Lot WorstCase | - | 10.31E-03 | 24.09E-03 | 17.61E-03 | 9.02E-03 | 6.79E-03 | 3.31E-03 |

**Test conditions : TID**
**Parameter : Base – Emitter Voltage : Vbe5**
**IC = 0.5 A Vce = 2 V**
Unit : V
Spec Limit Max : 1.500
Spec limits are represented in bold lines on the graphic.



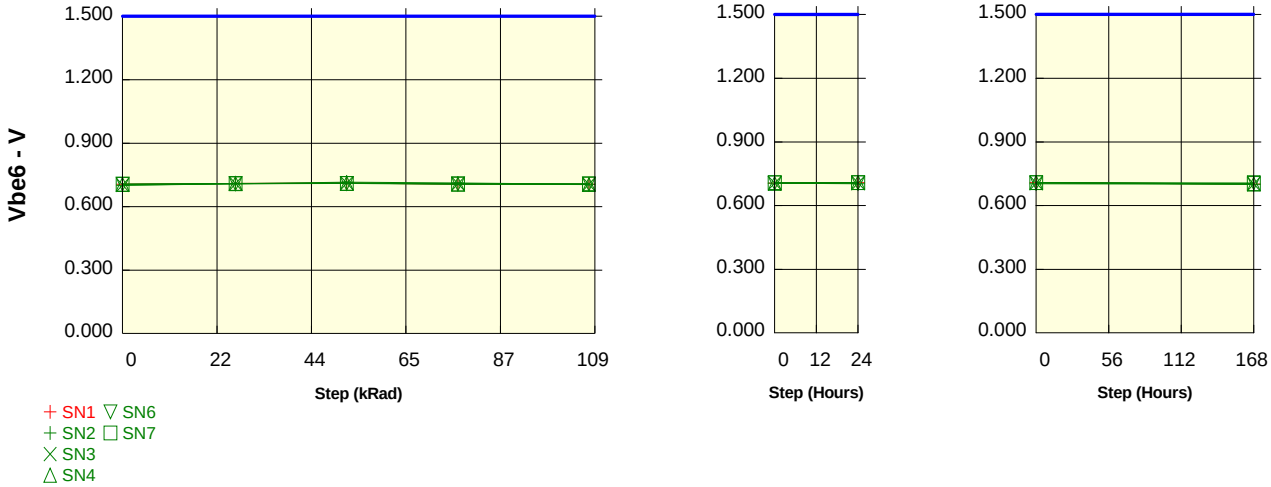

**Measurements**

| Vbe5 | 0 kRad | 26.3 kRad | 52.2 kRad | 78.1 kRad | 108.6 kRad | 24 Hours | 168 Hours |
|---|---|---|---|---|---|---|---|
| SN1_REF | 0.669 | 0.673 | 0.676 | 0.672 | 0.671 | 0.673 | 0.667 |
| On samples | | | | | | | |
| SN2 | 0.666 | 0.673 | 0.682 | 0.677 | 0.671 | 0.668 | 0.664 |
| SN3 | 0.667 | 0.672 | 0.676 | 0.674 | 0.670 | 0.671 | 0.667 |
| SN4 | 0.670 | 0.673 | 0.675 | 0.672 | 0.669 | 0.674 | 0.667 |
| SN6 | 0.670 | 0.673 | 0.674 | 0.673 | 0.672 | 0.673 | 0.670 |
| SN7 | 0.670 | 0.673 | 0.674 | 0.672 | 0.673 | 0.673 | 0.668 |
| Statistics | | | | | | | |
| Min | 0.666 | 0.672 | 0.674 | 0.672 | 0.669 | 0.668 | 0.664 |
| Max | 0.670 | 0.673 | 0.682 | 0.677 | 0.673 | 0.674 | 0.670 |
| Average | 0.668 | 0.673 | 0.676 | 0.673 | 0.671 | 0.672 | 0.667 |
| Sigma | 0.002 | 0.000 | 0.003 | 0.002 | 0.001 | 0.002 | 0.002 |
| (Vbe) Lot WorstCase | 0.674 | 0.674 | 0.685 | 0.679 | 0.675 | 0.678 | 0.674 |

**Drift Calculation**

| Vbe5 | 0 kRad | 26.3 kRad | 52.2 kRad | 78.1 kRad | 108.6 kRad | 24 Hours | 168 Hours |
|---|---|---|---|---|---|---|---|
| On samples | | | | | | | |
| SN2 | - | 7.52E-03 | 16.36E-03 | 11.56E-03 | 5.08E-03 | 2.52E-03 | -1.92E-03 |
| SN3 | - | 5.60E-03 | 9.36E-03 | 6.92E-03 | 3.56E-03 | 4.32E-03 | 519.99E-06 |
| SN4 | - | 2.68E-03 | 4.36E-03 | 1.72E-03 | -760.02E-06 | 3.96E-03 | -3.04E-03 |
| SN6 | - | 3.48E-03 | 4.48E-03 | 3.00E-03 | 2.20E-03 | 3.08E-03 | 320.02E-06 |
| SN7 | - | 3.28E-03 | 4.24E-03 | 2.00E-03 | 3.36E-03 | 3.32E-03 | -1.32E-03 |
| Average | - | 4.51E-03 | 7.76E-03 | 5.04E-03 | 2.69E-03 | 3.44E-03 | -1.09E-03 |
| Sigma | - | 1.80E-03 | 4.72E-03 | 3.75E-03 | 1.95E-03 | 637.98E-06 | 1.35E-03 |
| d(Vbe) Lot WorstCase | - | 9.91E-03 | 21.91E-03 | 16.30E-03 | 8.55E-03 | 5.35E-03 | 2.96E-03 |

**Test conditions : TID**
**Parameter : Base – Emitter Voltage : Vbe6**
**IC = 1 A Vce = 2 V**
Unit : V
Spec Limit Max : 1.500
Spec limits are represented in bold lines on the graphic.



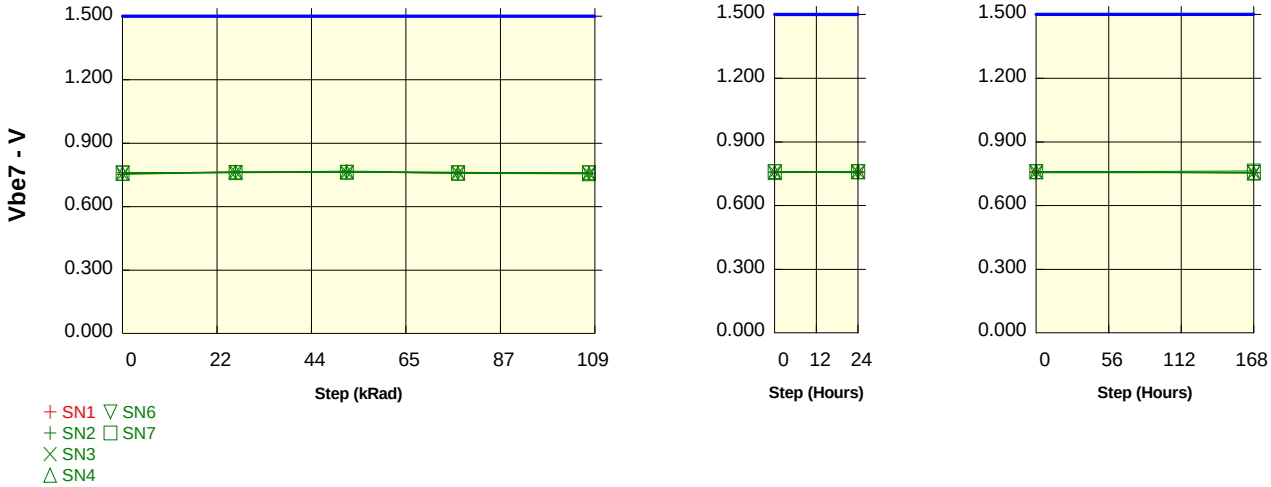

**Measurements**

| Vbe6 | 0 kRad | 26.3 kRad | 52.2 kRad | 78.1 kRad | 108.6 kRad | 24 Hours | 168 Hours |
|---|---|---|---|---|---|---|---|
| SN1_REF | 0.705 | 0.709 | 0.711 | 0.707 | 0.706 | 0.708 | 0.702 |
| On samples | | | | | | | |
| SN2 | 0.701 | 0.709 | 0.716 | 0.712 | 0.706 | 0.703 | 0.700 |
| SN3 | 0.702 | 0.709 | 0.711 | 0.708 | 0.705 | 0.706 | 0.702 |
| SN4 | 0.705 | 0.709 | 0.710 | 0.706 | 0.704 | 0.709 | 0.702 |
| SN6 | 0.706 | 0.709 | 0.710 | 0.708 | 0.707 | 0.708 | 0.707 |
| SN7 | 0.705 | 0.708 | 0.710 | 0.707 | 0.708 | 0.708 | 0.704 |
| Statistics | | | | | | | |
| Min | 0.701 | 0.708 | 0.710 | 0.706 | 0.704 | 0.703 | 0.700 |
| Max | 0.706 | 0.709 | 0.716 | 0.712 | 0.708 | 0.709 | 0.707 |
| Average | 0.704 | 0.709 | 0.711 | 0.708 | 0.706 | 0.707 | 0.703 |
| Sigma | 0.002 | 0.000 | 0.003 | 0.002 | 0.001 | 0.002 | 0.002 |
| (Vbe) Lot WorstCase | 0.710 | 0.710 | 0.719 | 0.714 | 0.710 | 0.713 | 0.710 |

**Drift Calculation**

| Vbe6 | 0 kRad | 26.3 kRad | 52.2 kRad | 78.1 kRad | 108.6 kRad | 24 Hours | 168 Hours |
|---|---|---|---|---|---|---|---|
| On samples | | | | | | | |
| SN2 | - | 8.08E-03 | 15.80E-03 | 11.00E-03 | 5.04E-03 | 2.76E-03 | -280.02E-06 |
| SN3 | - | 6.44E-03 | 8.52E-03 | 6.12E-03 | 3.00E-03 | 4.00E-03 | -79.99E-06 |
| SN4 | - | 3.96E-03 | 4.88E-03 | 959.99E-06 | -1.36E-03 | 3.12E-03 | -3.68E-03 |
| SN6 | - | 3.12E-03 | 3.76E-03 | 1.72E-03 | 1.20E-03 | 1.84E-03 | 1.40E-03 |
| SN7 | - | 2.84E-03 | 4.40E-03 | 1.88E-03 | 3.08E-03 | 3.08E-03 | -1.52E-03 |
| Average | - | 4.89E-03 | 7.47E-03 | 4.34E-03 | 2.19E-03 | 2.96E-03 | -832.00E-06 |
| Sigma | - | 2.04E-03 | 4.48E-03 | 3.79E-03 | 2.15E-03 | 695.11E-06 | 1.70E-03 |
| d(Vbe) Lot WorstCase | - | 11.00E-03 | 20.91E-03 | 15.71E-03 | 8.65E-03 | 5.05E-03 | 4.27E-03 |

**Test conditions : TID**
**Parameter : Base – Emitter Voltage : Vbe7**
**IC = 2 A Vce = 2 V**
Unit : V
Spec Limit Max : 1.500
Spec limits are represented in bold lines on the graphic.



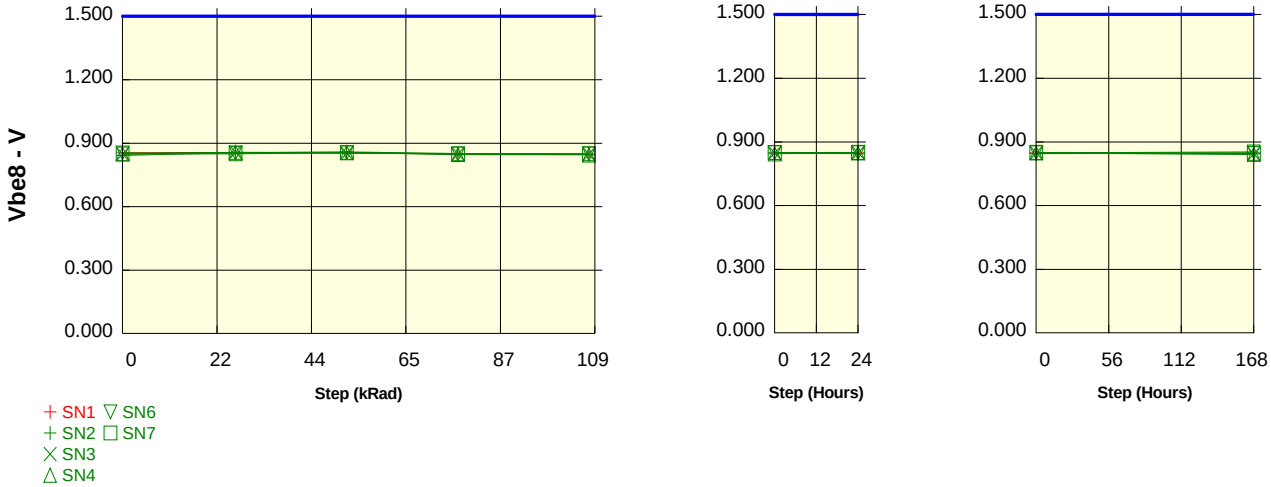

**Measurements**

| Vbe7 | 0 kRad | 26.3 kRad | 52.2 kRad | 78.1 kRad | 108.6 kRad | 24 Hours | 168 Hours |
|---|---|---|---|---|---|---|---|
| SN1_REF | 0.760 | 0.763 | 0.764 | 0.759 | 0.758 | 0.760 | 0.755 |
| On samples | | | | | | | |
| SN2 | 0.753 | 0.761 | 0.769 | 0.763 | 0.758 | 0.756 | 0.755 |
| SN3 | 0.756 | 0.764 | 0.763 | 0.760 | 0.757 | 0.758 | 0.755 |
| SN4 | 0.758 | 0.764 | 0.764 | 0.758 | 0.756 | 0.760 | 0.753 |
| SN6 | 0.760 | 0.762 | 0.763 | 0.760 | 0.760 | 0.759 | 0.763 |
| SN7 | 0.758 | 0.761 | 0.763 | 0.760 | 0.760 | 0.760 | 0.756 |
| Statistics | | | | | | | |
| Min | 0.753 | 0.761 | 0.763 | 0.758 | 0.756 | 0.756 | 0.753 |
| Max | 0.760 | 0.764 | 0.769 | 0.763 | 0.760 | 0.760 | 0.763 |
| Average | 0.757 | 0.762 | 0.764 | 0.760 | 0.758 | 0.759 | 0.757 |
| Sigma | 0.003 | 0.001 | 0.002 | 0.002 | 0.002 | 0.002 | 0.003 |
| (Vbe) Lot WorstCase | 0.765 | 0.767 | 0.771 | 0.765 | 0.763 | 0.764 | 0.767 |

**Drift Calculation**

| Vbe7 | 0 kRad | 26.3 kRad | 52.2 kRad | 78.1 kRad | 108.6 kRad | 24 Hours | 168 Hours |
|---|---|---|---|---|---|---|---|
| On samples | | | | | | | |
| SN2 | - | 8.80E-03 | 16.12E-03 | 10.60E-03 | 5.24E-03 | 3.04E-03 | 2.92E-03 |
| SN3 | - | 8.16E-03 | 7.60E-03 | 4.48E-03 | 1.84E-03 | 2.72E-03 | -839.95E-06 |
| SN4 | - | 6.32E-03 | 6.32E-03 | -320.02E-06 | -2.48E-03 | 1.64E-03 | -4.76E-03 |
| SN6 | - | 1.20E-03 | 2.76E-03 | -800.01E-06 | -880.00E-06 | -920.00E-06 | 2.72E-03 |
| SN7 | - | 2.40E-03 | 4.76E-03 | 1.60E-03 | 2.20E-03 | 2.20E-03 | -1.72E-03 |
| Average | - | 5.38E-03 | 7.51E-03 | 3.11E-03 | 1.18E-03 | 1.74E-03 | -336.00E-06 |
| Sigma | - | 3.05E-03 | 4.60E-03 | 4.18E-03 | 2.67E-03 | 1.41E-03 | 2.89E-03 |
| d(Vbe) Lot WorstCase | - | 14.54E-03 | 21.30E-03 | 15.65E-03 | 9.19E-03 | 5.97E-03 | 8.33E-03 |

**Test conditions : TID**
**Parameter : Base – Emitter Voltage : Vbe8**
**IC = 4 A Vce = 2 V**
Unit : V
Spec Limit Max : 1.500
Spec limits are represented in bold lines on the graphic.



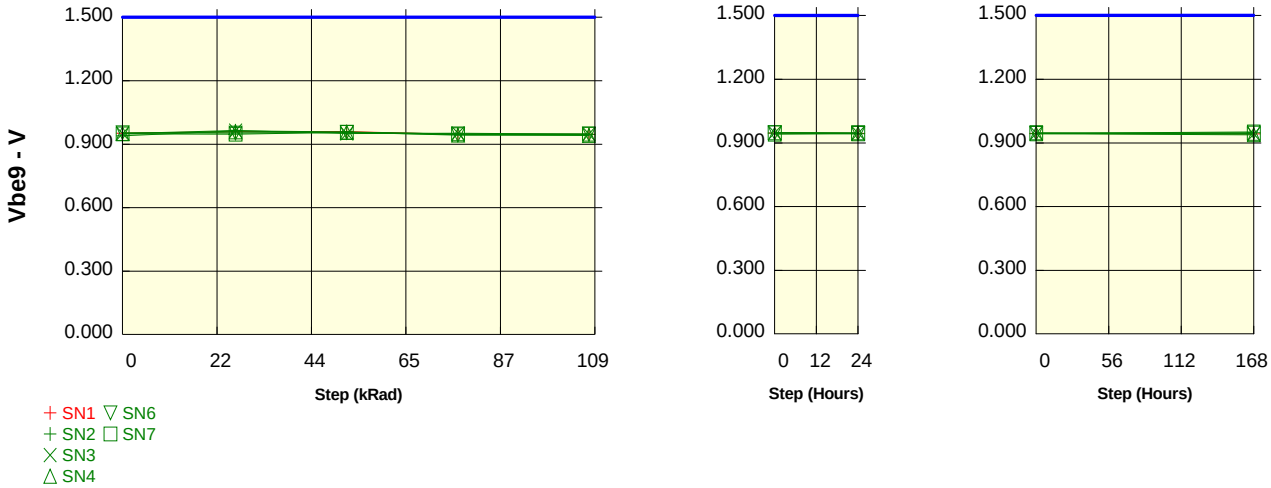

**Measurements**

| Vbe8 | 0 kRad | 26.3 kRad | 52.2 kRad | 78.1 kRad | 108.6 kRad | 24 Hours | 168 Hours |
|---|---|---|---|---|---|---|---|
| SN1_REF | 0.853 | 0.856 | 0.856 | 0.848 | 0.848 | 0.849 | 0.844 |
| On samples | | | | | | | |
| SN2 | 0.842 | 0.856 | 0.859 | 0.851 | 0.848 | 0.845 | 0.848 |
| SN3 | 0.848 | 0.857 | 0.853 | 0.849 | 0.848 | 0.848 | 0.844 |
| SN4 | 0.849 | 0.857 | 0.857 | 0.846 | 0.844 | 0.847 | 0.841 |
| SN6 | 0.854 | 0.853 | 0.855 | 0.848 | 0.849 | 0.848 | 0.852 |
| SN7 | 0.849 | 0.850 | 0.855 | 0.850 | 0.850 | 0.850 | 0.846 |
| Statistics | | | | | | | |
| Min | 0.842 | 0.850 | 0.853 | 0.846 | 0.844 | 0.845 | 0.841 |
| Max | 0.854 | 0.857 | 0.859 | 0.851 | 0.850 | 0.850 | 0.852 |
| Average | 0.849 | 0.855 | 0.856 | 0.849 | 0.848 | 0.848 | 0.846 |
| Sigma | 0.004 | 0.003 | 0.002 | 0.002 | 0.002 | 0.002 | 0.004 |
| (Vbe) Lot WorstCase | 0.860 | 0.862 | 0.862 | 0.855 | 0.854 | 0.853 | 0.858 |

**Drift Calculation**

| Vbe8 | 0 kRad | 26.3 kRad | 52.2 kRad | 78.1 kRad | 108.6 kRad | 24 Hours | 168 Hours |
|---|---|---|---|---|---|---|---|
| On samples | | | | | | | |
| SN2 | - | 13.40E-03 | 16.68E-03 | 9.16E-03 | 5.56E-03 | 3.20E-03 | 6.24E-03 |
| SN3 | - | 8.44E-03 | 4.44E-03 | 840.01E-06 | -639.98E-06 | -480.00E-06 | -4.76E-03 |
| SN4 | - | 7.48E-03 | 7.08E-03 | -3.56E-03 | -5.16E-03 | -2.08E-03 | -8.04E-03 |
| SN6 | - | -760.02E-06 | 1.40E-03 | -5.48E-03 | -4.56E-03 | -5.32E-03 | -1.32E-03 |
| SN7 | - | 1.44E-03 | 5.68E-03 | 1.12E-03 | 1.20E-03 | 1.40E-03 | -2.80E-03 |
| Average | - | 6.00E-03 | 7.06E-03 | 416.03E-06 | -719.98E-06 | -656.00E-06 | -2.14E-03 |
| Sigma | - | 5.09E-03 | 5.16E-03 | 5.05E-03 | 3.94E-03 | 2.93E-03 | 4.75E-03 |
| d(Vbe) Lot WorstCase | - | 21.26E-03 | 22.55E-03 | 15.58E-03 | 11.10E-03 | 8.13E-03 | 12.13E-03 |

**Test conditions : TID**
**Parameter : Base – Emitter Voltage : Vbe9**
**IC = 6 A Vce = 2 V**
Unit : V
Spec Limit Max : 1.500
Spec limits are represented in bold lines on the graphic.



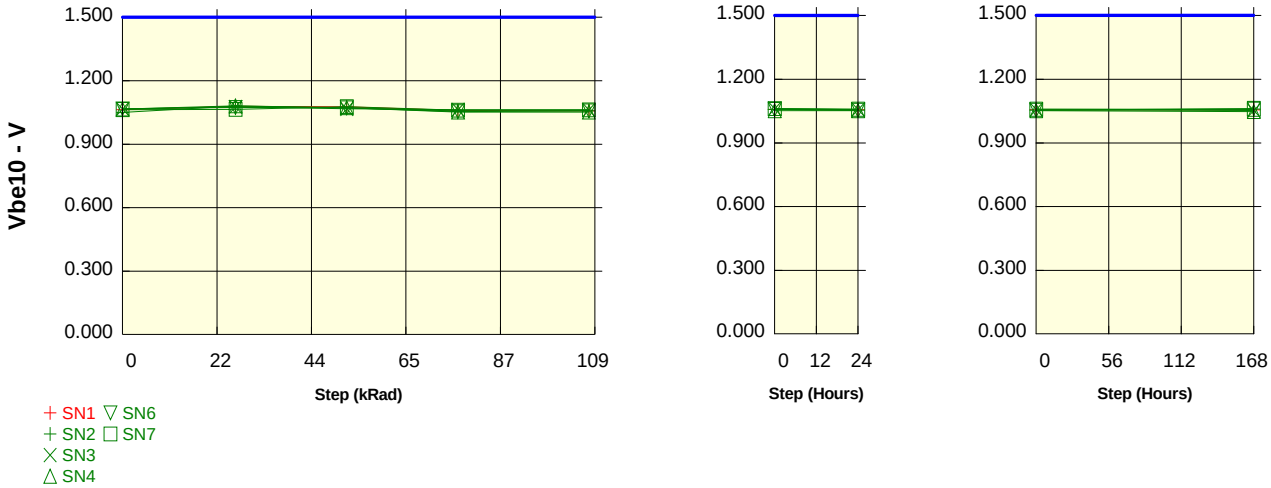

**Measurements**

| Vbe9 | 0 kRad | 26.3 kRad | 52.2 kRad | 78.1 kRad | 108.6 kRad | 24 Hours | 168 Hours |
|---|---|---|---|---|---|---|---|
| SN1_REF | 0.951 | 0.960 | 0.959 | 0.947 | 0.946 | 0.945 | 0.943 |
| On samples | | | | | | | |
| SN2 | 0.940 | 0.963 | 0.957 | 0.948 | 0.946 | 0.943 | 0.947 |
| SN3 | 0.950 | 0.964 | 0.950 | 0.952 | 0.948 | 0.945 | 0.942 |
| SN4 | 0.950 | 0.959 | 0.956 | 0.942 | 0.941 | 0.943 | 0.938 |
| SN6 | 0.954 | 0.953 | 0.956 | 0.945 | 0.947 | 0.945 | 0.951 |
| SN7 | 0.949 | 0.948 | 0.956 | 0.949 | 0.948 | 0.948 | 0.945 |
| Statistics | | | | | | | |
| Min | 0.940 | 0.948 | 0.950 | 0.942 | 0.941 | 0.943 | 0.938 |
| Max | 0.954 | 0.964 | 0.957 | 0.952 | 0.948 | 0.948 | 0.951 |
| Average | 0.949 | 0.957 | 0.955 | 0.947 | 0.946 | 0.945 | 0.945 |
| Sigma | 0.005 | 0.006 | 0.003 | 0.003 | 0.003 | 0.002 | 0.005 |
| (Vbe) Lot WorstCase | 0.963 | 0.975 | 0.963 | 0.957 | 0.954 | 0.950 | 0.958 |

**Drift Calculation**

| Vbe9 | 0 kRad | 26.3 kRad | 52.2 kRad | 78.1 kRad | 108.6 kRad | 24 Hours | 168 Hours |
|---|---|---|---|---|---|---|---|
| On samples | | | | | | | |
| SN2 | - | 22.88E-03 | 17.44E-03 | 7.72E-03 | 6.28E-03 | 3.52E-03 | 7.24E-03 |
| SN3 | - | 13.68E-03 | -159.98E-06 | 1.28E-03 | -2.36E-03 | -4.92E-03 | -8.56E-03 |
| SN4 | - | 8.36E-03 | 6.24E-03 | -7.96E-03 | -9.00E-03 | -7.04E-03 | -12.08E-03 |
| SN6 | - | -760.02E-06 | 2.24E-03 | -9.20E-03 | -6.44E-03 | -9.04E-03 | -2.36E-03 |
| SN7 | - | -1.24E-03 | 7.16E-03 | -519.99E-06 | -1.20E-03 | -1.04E-03 | -3.80E-03 |
| Average | - | 8.58E-03 | 6.58E-03 | -1.74E-03 | -2.54E-03 | -3.70E-03 | -3.91E-03 |
| Sigma | - | 9.10E-03 | 6.04E-03 | 6.24E-03 | 5.23E-03 | 4.48E-03 | 6.56E-03 |
| d(Vbe) Lot WorstCase | - | 35.89E-03 | 24.72E-03 | 16.97E-03 | 13.13E-03 | 9.74E-03 | 15.77E-03 |

**Test conditions : TID**
**Parameter : Base – Emitter Voltage : Vbe10**
**IC = 8 A Vce = 2 V**
Unit : V
Spec Limit Max : 1.500
Spec limits are represented in bold lines on the graphic.



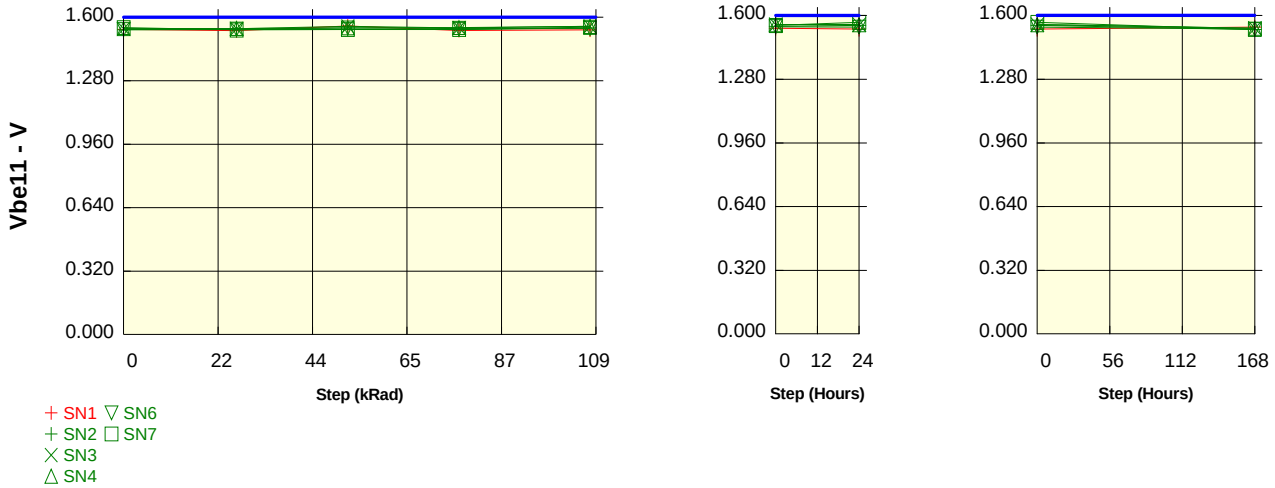

**Measurements**

| Vbe10 | 0 kRad | 26.3 kRad | 52.2 kRad | 78.1 kRad | 108.6 kRad | 24 Hours | 168 Hours |
|---|---|---|---|---|---|---|---|
| SN1_REF | 1.063 | 1.079 | 1.076 | 1.059 | 1.058 | 1.057 | 1.056 |
| On samples | | | | | | | |
| SN2 | 1.051 | 1.080 | 1.072 | 1.057 | 1.059 | 1.055 | 1.059 |
| SN3 | 1.066 | 1.076 | 1.067 | 1.063 | 1.062 | 1.057 | 1.053 |
| SN4 | 1.066 | 1.082 | 1.072 | 1.052 | 1.052 | 1.052 | 1.048 |
| SN6 | 1.068 | 1.074 | 1.072 | 1.054 | 1.058 | 1.054 | 1.062 |
| SN7 | 1.064 | 1.065 | 1.078 | 1.061 | 1.062 | 1.059 | 1.059 |
| Statistics | | | | | | | |
| Min | 1.051 | 1.065 | 1.067 | 1.052 | 1.052 | 1.052 | 1.048 |
| Max | 1.068 | 1.082 | 1.078 | 1.063 | 1.062 | 1.059 | 1.062 |
| Average | 1.063 | 1.075 | 1.072 | 1.057 | 1.058 | 1.055 | 1.056 |
| Sigma | 0.006 | 0.006 | 0.003 | 0.004 | 0.004 | 0.002 | 0.005 |
| (Vbe) Lot WorstCase | 1.081 | 1.093 | 1.082 | 1.070 | 1.069 | 1.062 | 1.072 |

**Drift Calculation**

| Vbe10 | 0 kRad | 26.3 kRad | 52.2 kRad | 78.1 kRad | 108.6 kRad | 24 Hours | 168 Hours |
|---|---|---|---|---|---|---|---|
| On samples | | | | | | | |
| SN2 | - | 28.96E-03 | 21.36E-03 | 6.36E-03 | 7.84E-03 | 3.96E-03 | 8.20E-03 |
| SN3 | - | 10.32E-03 | 880.00E-06 | -2.84E-03 | -4.28E-03 | -9.04E-03 | -13.16E-03 |
| SN4 | - | 15.64E-03 | 6.24E-03 | -14.40E-03 | -14.60E-03 | -14.24E-03 | -18.24E-03 |
| SN6 | - | 5.96E-03 | 4.28E-03 | -13.80E-03 | -9.80E-03 | -13.84E-03 | -5.08E-03 |
| SN7 | - | 1.16E-03 | 13.84E-03 | -3.00E-03 | -2.00E-03 | -4.96E-03 | -5.00E-03 |
| Average | - | 12.41E-03 | 9.32E-03 | -5.54E-03 | -4.57E-03 | -7.62E-03 | -6.66E-03 |
| Sigma | - | 9.56E-03 | 7.37E-03 | 7.77E-03 | 7.60E-03 | 6.72E-03 | 8.97E-03 |
| d(Vbe) Lot WorstCase | - | 41.08E-03 | 31.43E-03 | 17.78E-03 | 18.23E-03 | 12.53E-03 | 20.26E-03 |

**Test conditions : TID**
**Parameter : Base – Emitter Voltage : Vbe11**
**IC = 15 A Vce = 2 V**
Unit : V
Spec Limit Max : 1.600
Spec limits are represented in bold lines on the graphic.




**Measurements**

| Vbe11 | 0 kRad | 26.3 kRad | 52.2 kRad | 78.1 kRad | 108.6 kRad | 24 Hours | 168 Hours |
|---|---|---|---|---|---|---|---|
| SN1_REF | 1.540 | 1.532 | 1.556 | 1.534 | 1.536 | 1.532 | 1.542 |
| On samples | | | | | | | |
| SN2 | 1.536 | 1.538 | 1.540 | 1.538 | 1.546 | 1.550 | 1.530 |
| SN3 | 1.542 | 1.542 | 1.554 | 1.546 | 1.554 | 1.554 | 1.536 |
| SN4 | 1.542 | 1.544 | 1.546 | 1.548 | 1.554 | 1.554 | 1.536 |
| SN6 | 1.538 | 1.540 | 1.546 | 1.544 | 1.544 | 1.542 | 1.532 |
| SN7 | 1.548 | 1.536 | 1.538 | 1.538 | 1.550 | 1.566 | 1.530 |
| Statistics | | | | | | | |
| Min | 1.536 | 1.536 | 1.538 | 1.538 | 1.544 | 1.542 | 1.530 |
| Max | 1.548 | 1.544 | 1.554 | 1.548 | 1.554 | 1.566 | 1.536 |
| Average | 1.541 | 1.540 | 1.545 | 1.543 | 1.550 | 1.553 | 1.533 |
| Sigma | 0.004 | 0.003 | 0.006 | 0.004 | 0.004 | 0.008 | 0.003 |
| (Vbe) Lot WorstCase | 1.554 | 1.548 | 1.562 | 1.555 | 1.562 | 1.576 | 1.541 |

**Drift Calculation**

| Vbe11 | 0 kRad | 26.3 kRad | 52.2 kRad | 78.1 kRad | 108.6 kRad | 24 Hours | 168 Hours |
|---|---|---|---|---|---|---|---|
| On samples | | | | | | | |
| SN2 | - | 2.00E-03 | 4.00E-03 | 2.00E-03 | 10.00E-03 | 14.00E-03 | -6.00E-03 |
| SN3 | - | 0.00E+00 | 12.00E-03 | 4.00E-03 | 12.00E-03 | 12.00E-03 | -6.00E-03 |
| SN4 | - | 2.00E-03 | 4.00E-03 | 6.00E-03 | 12.00E-03 | 12.00E-03 | -6.00E-03 |
| SN6 | - | 2.00E-03 | 8.00E-03 | 6.00E-03 | 6.00E-03 | 4.00E-03 | -6.00E-03 |
| SN7 | - | -12.00E-03 | -10.00E-03 | -10.00E-03 | 2.00E-03 | 18.00E-03 | -18.00E-03 |
| Average | - | -1.20E-03 | 3.60E-03 | 1.60E-03 | 8.40E-03 | 12.00E-03 | -8.40E-03 |
| Sigma | - | 5.46E-03 | 7.42E-03 | 5.99E-03 | 3.88E-03 | 4.56E-03 | 4.80E-03 |
| d(Vbe) Lot WorstCase | - | 15.17E-03 | 25.86E-03 | 19.56E-03 | 20.03E-03 | 25.68E-03 | 6.00E-03 |